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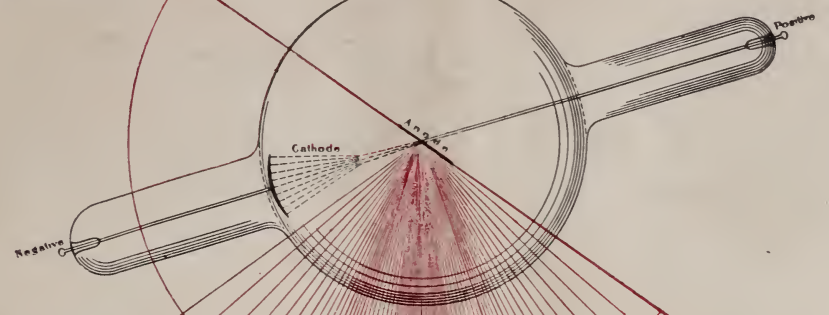
July, 1902. Vol. 11. No 1.



AMERICAN X RAY JOURNAL

THE AMERICAN X-RAY JOURNAL

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

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CHARLES P. RENNER, M. D., M. E., Editor.

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FRED S. O'HARA, M. D.,
Springfield, Ill.

THE AMERICAN
X-RAY JOURNAL.

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

VOL. 11. *ST. LOUIS, JULY, 1902.* *No. 1.*

The Practical X-Ray Diagnosis.

Prepared by J. Rudis-Jicinsky, A. M., M. D., M. E.
Cedar Rapids, Ia. Revised by M. U. Dr.
Joseph Hoffman, Vienna Austria.

A series of A B C teaching for workers in x-ray diagnosis and therapeutics, to be concluded in 20 articles. Fully illustrated.

Tesla Transformers.

LESSON VI.

When in 1895 Prof. William Conrad Roentgen made known his wonderful discovery, scientific men the world over sought new methods for the generation of the remarkable x-ray. In no country was greater enthusiasm shown than in this country, but Germany still leads in all that pertains to the new method of correct diagnosis. Prof. Roentgen gave his opinion about the source of the x-ray in his communication, as follows:

Preliminary communication to the Wuerzburg Physico-Medical Society, December, 1895.

"After experiments bearing specially on this question, it is certain that the spot on the wall of the discharge apparatus, which fluoresces most decidedly, must be regarded as the principal point of the radiation of the x-rays in all directions. The x-rays thus start at the point at which, according to the researches of different investigators, the cathode rays impinge upon the wall of the glass tube. If one deflects the cathode rays within the apparatus by a magnet it is found that the x-rays are entitled from another spot—that is to say, from the new termination of the cathode stream—I therefore come to the conclusion that the x-rays are not identical with the cathode rays, but that they are generated by the cathode rays at the glass wall of the discharge apparatus."

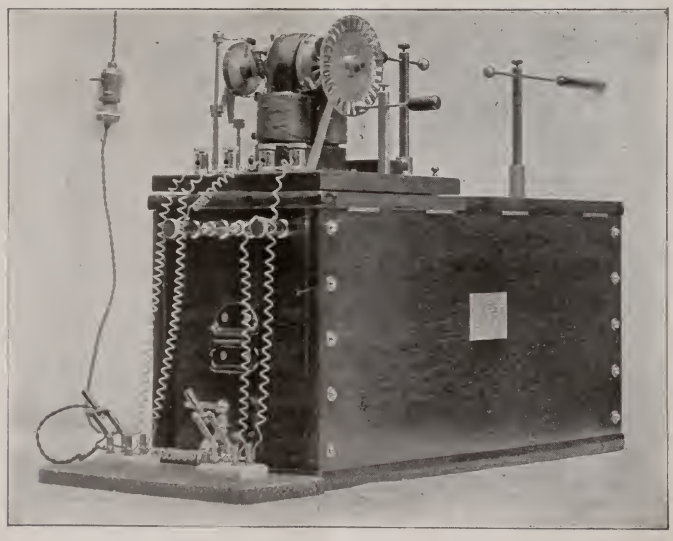
This opinion was followed and the perfection of the primitive coil made the aim of all experimenters. When Tesla took up x-ray work, and gave us his coil, he contributed to the art of Radiology very much, because the source of electricity in operating this coil was very large, the experimentation could progress little further and brought out the theory that the x-ray is at least anticathodic and begins not only at the fluorescent spot on the glass bulb, but the point of any substance placed within the tube, where the cathodic rays strike. The extraordinary power of Tesla's high potential, high-frequency coil was demonstrated by him and others. The x-rays produced by the use of his coil are such that the dry-plate may be affected at a distance of forty feet.

With Tesla's apparatus we have to have his transformer consisting of an induction coil having but few widely separated turns of primary wires, the secondary wires being highly insulated and in few numbers and use oscillatory electrical currents. The coil may be

connected with Leyden jars and we get discharges of high frequency of alteration. If we wish to, the Tesla coil may be connected with the Leyden jars on a Static machine, and if it is of proper size, the x-rays produced this way in the tube are most beautiful. Such perfection of apparatus with the jars of the largest type, long spark-gape, for developing the x-rays, in such quantities and of such penetrating qualities, make them an indispensable diagnostic adjunct in every difficult case. The proper connections with jars and static are shown in May issue of this Journal.

pensed with, a current interrupter being used instead, but an Electrical Condenser, on account of its convenient form ease of operation and power of generating the highest degree of electromotive force may be added to our armamentarium.

The Electrical Condenser was invented by Volta, in the later part of the eighteenth century, and it is so called because its power of accumulating electricity, which is received in repeated charges from other bodies until quantities too minute in themselves to be otherwise perceptible, have been collected



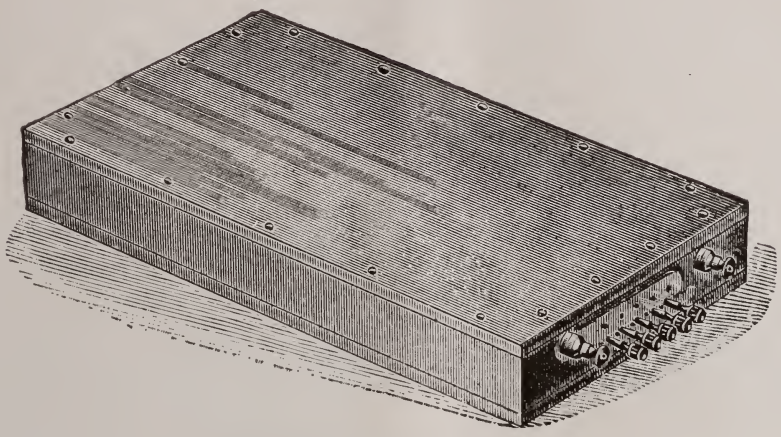
High Frequency Coil. Fig. 1.

Electrical Condenser.

In order to obtain satisfactory results in the use of coils for x-ray work, carefully constructed apparatus is required, one in which the windings of the primary and secondary coils are accurately proportioned. The insulation of the primary from the secondary must also be perfect, so as to prevent leakage, otherwise a short-circuit is produced and the efficiency of the coil is destroyed. On the coils made to run on the 110 and 120 volt circuit, the Vibrator is dis-

to any desired amount. The condenser of to-day is a great improvement upon the original air condenser introduced by Volta, although the electrical laws are the same. It is an apparatus whose function is to accumulate by induction a large or small amount of electricity, depending upon the capacity of particular instrument, on a comparatively small surface, and in short space of time. We may effect certain results with the condenser through the instrument upon which it is devised to act or utilize to absorb or divert what may be termed

"waste electricity," the surplus energy and obviate the spark at the contact points in connection with our coil. To increase the capacity of an adjustable condenser plugs are inserted, to decrease the same the plugs are removed. See illustration in May issue of this Journal.



Electrical Condenser. Fig. 2.

INTERRUPTER.

LESSON VII.

With the advancement of the x-ray technic the desire arose for knowledge to determine the conditions under which skiagraphs of the thicker parts of the body may be successfully taken—one of such conditions being the knowledge of the number of interruptions in our current used for generating the x-rays. As stated already, we can vary the number of particles in the vacuum tube by expelling gas from anode, or by a regulator which liberates, by the action of current upon a chemical, artificially gas. We can expel gas from anode by introducing a variable capacity discharge in anode end of the tube, and in this way lower vacuum, and by capacity discharge in cathode end and no discharge in anode end of the tube, may raise vacuum. By the regulation of these two capacities we can maintain the vacuum at a certain degree, and by varying the intensity of the current we have to understand the amount being expressed in so and so many amperes, volts at certain time. But such data of pressure and quantity of current given theoretically are quite worthless without the knowledge of the number of the interruptions of the coil or the static machine. To beginners, especially in the branch of x-ray technic, the interrupter will prove to be indispensable, and will also be essentially valuable in judging the efficiency of the apparatus. We have already stated that the value of a coil or static machine depends not simply on length of spark generally—efficiency must be estimated by the "maximum" spark-length of each "interruption" when the apparatus is working at very high speed. Thirteen to sixteen hundred interruptions per minute we consider a very good rate for skiagraphy and screen work; however, this rate can be increased to a speed of 2,000 interruptions per minute. At above stated speeds the light emitted from the x-ray tube will appear perfectly inert and steady upon the fluorescent screen. In order to be able to count the interruptions, we have to have a SPEED INDICATOR OR TACHOMETER. The indicator which is driven by a motor gives direct readings of the number of

interruptions per minute, without the AID OF A WATCH, ETC. There are many interrupters in the market and have different names. In the May issue of this Journal we gave an illustration of the rotatory interrupter, which consists of small electro-motor with an excentric disc, by which a silver rim is raised and lowered at great speed, thus making contacts in a mercury vessel. The motor and the glass vessel are mounted on a base. The later is further provided with two terminals for connecting the small accumulator battery intended for supplying the motor, and also a necessary switch. Platinum rapid interrupter is another device used in Germany with large coils especially. In this case no mercury is required, and the working of the apparatus is more clean. In France they use another device, but on the same principle. The interrupters in this country are made in accordance with the Wehnelt or Caldwell interrupters and seem to be much simpler; for instance, Mechanical Current interrupter, etc. Nearly in all of them brush or other mechanism closes the current through interruption when the platinum needle or wire is immersed to various lengths in mercury or some acid solution, and as the length of immersion determines the amount of current, its working principle is very simple. This gives the most delicate regulations, because the intensity of the current may be varied from zero to full capacity.

Very simple and efficient Mercury Jet Interrupter, the latest on the market, is the one of Cunningham. Unlike the well-known German turbine mercury jet interrupter and that of Boas, it contains no fluid non-conductor, such as alcohol, or oil, which may prolong the arc at the break, rapidly carbonize and contamine the mercury. The very good feature of this apparatus is the automatic manner in which it prevents the occurrence of an undue rise of current through the primary of our coil, when the motive power fails.

As to the interrupter with a static machine, there are many also, but the Monell's interrupters are satisfactory. These are to be secured upon the rubber handles of the sliding poles of the static machine, the sliding poles being drawn a foot or more apart, and connected by wires to the tube fixed in the tube-holder. The sliding handle of each interrupter should be adjusted so that the metallic ball is at first in actual contact with the outer brass ball of each prime conductor. The spark gap necessary to produce the best x-rays is regulated by drawing the sliding handles away from the prime conductors.

Spark Tester.

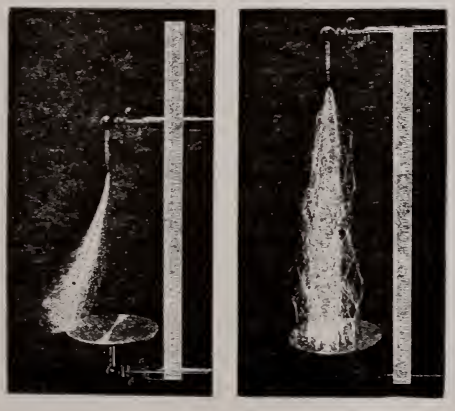
LESSON VIII.

It is always well to test the maximum spark length before each examination especially with the induction coil. When it is desired to make a proper test, discharges are used, consisting of spark point and disc as shown in our illustration. In starting the sparks place both stands at a distance of about two inches between disc and point and see whether the sparks are escaping from the point to the center of the disc. Then separate the stands to the fullest extent. With the static machine the sliding poles are the best testers, especially if they are drawn wide apart. If proper connections are made, the negative terminal connected by wire to the negative pole and the positive to the positive of the tube we may observe the short spark gape between the ball of the interrupters and the larger ball of each sliding pole. If we wish to, we may use Cleaves Current Controller with our sta-

tic machine and see the quantity or amperage which is desired with given periods. Beside the spark-tester in successful skiagraphy of ours, we have to remember IN EACH CASE ALL THE CHARACTERISTICS OF OUR SUBJECT, noting precisely all the peculiarities, age, density and general structure, as to the muscle and fat. The latter are of great importance in determining the results of skiagraphy of the human body.

STAND FOR TUBES,
WITH WIRE-HOLDER.

For holding the tubes we have especially constructed wooden or metallic stand, adjustable, rigid, holding a tube without vibration, as shown



Spark Tester. Fig. 3.

in our illustrations. Some stands are about two metres high and consist of a heavy iron foot with a vertical rod, through which the clamp holding the tube may be in horizontal position, and the vertical rod, a movable wire holder is fastened, which serves to support the conducting wires and to keep them away from the patient, so that the latter is in no danger to receive a shock. There can be no sparking from tube to stand. When a static machine is used, be horizontally adjusted. At the top of the common stand may be employed with a wooden adjustment for the tube and a bar with clamps for the wires. The wires have to be insulated, rubber tubing around them, which besides the common insulation proved very useful in various operations with x-ray. For hospitals with powerful apparatus that A. W. L. Universal tube holder, designed by Rollins is recommended. The tube in this case is held in a wooden box which is opaque to all x-ray except which comes through an adjustable round opening, and so confines the rays to go at the required size of area, of the object to be examined. In special box there is also a small lamp to warm the tube if necessary, and to reduce the vacuum.

THE CASKET.

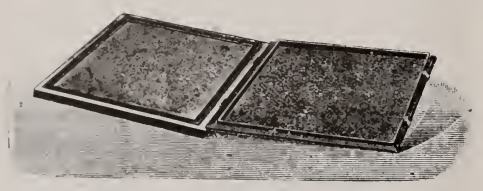
In skiagraphy we use a plate-holder for our dry plates or have the plates in black and yellow envelopes, but in the work with intensifying screens—or two of them if the photographic plate has two prepared sides—it is necessary to carry the plates into the dark room and there to wrap each plate in two or three sheets of non-transparent paper, otherwise we would be obliged to possess a great number of intensifying screens. This inconvenience is overcome by using a casket in the form as illustrated. The casket is supplied with number of card board frames to suit the different sizes of plates. The cover is constructed so as to prevent any influx of light.

LESSON IX.

THE DRY PLATES FILMS
AND SENSITIZED PAPER.

To obtain good results in skiagraphy we have to use fresh dry plates of high sensitiveness both as to light and to colors. We generally use highly sensitive Cramers x-ray plates, made expressly for x-ray work. The plates may be wrapped before exposure

in two envelopes, a dark one and another yellow of non-transparent paper. This way they are ready for use, the film side being marked. If a plate-holder or casket is used, we do not need the envelopes. If the tube is soft—low vacuum exposures on the extremities may be short without the intensifying screen, but if the tube is hard—high vacuum—exposures will require more time at a greater distance of the tube from the object. First we have to ascertain if the x-rays penetrate the parts to be skiagraphed with the fluoroscope in our hand, then stop the apparatus and bring our plate or film in. The plate is pushed under the part to be photographed, the side to be examined towards the film of the plate, the anode of the tube turned downward so that its center will be on a direct line with the center of the plate or film, at the given distance. After



The Casket. Fig. 4.

the exposure, remove the plate to a safe place or dark room, and develop the same. When parts are photographed, which perspire or produce much warmth such as the feet, the plate should be not only in envelopes, but in addition also wrapped in oil-cloth to be sufficiently protected against the influence of perspiration. A scratch on the plate or air bubbles must be avoided and recognized in time. Those who have some experience in photographing will do good to keep to the manner or custom of developing, fixing, intensifying, etc., with which they may be acquainted, because the handling of these plates does not differ in any way from that of regular brands. The developer which has given us the best results is the "Pyro Eikocum Hydro or J. C. Tabloids." The plates should be developed more than is generally the case with the ordinary plates. It is necessary to continue the developing until the picture appears distinctly. We have never seen any rules laid down for developing the x-ray plates, but we spoiled many a good picture by not continuing the development long enough. The developers named must be used much stronger than the formula given for ordinary plates and add two drachms of 10 per cent solution of bromide of potash as a restrainer instead of about ten drops as for ordinary plates. If we use the J. C. Tabloid's very convenient method, for the general practitioner, especially, we have to take three J and three C Tabloids and dissolve in five ounces of water, then add two drachms, 10 per cent solution of bromide potash. We also have some solution in stock of the tabloids made on hand to add if the picture is very slow in turning dark, and some extra bromide if it turns dark immediately, showing over-exposure. As to the printing of our pictures we may try it again, if we do not get a good picture, but if we do not develop a negative well, we cannot do it over. The dark room, which is needed can readily be established. We have one in our laboratory made like the vapor cabinet; it is very light and may be folded and is portable. After having developed the plate, wash it carefully and place into the fixing bath. Then put it into a basin of clean water, to remain for half an hour at least, to allow the soluble salts to leave the sensitive film. After this place the plate for drying. The pictures are copied in the usual way known in photography, viz., by sensitive paper (I prefer to print on matt velox paper), held against the plate in copying frame, and exposed to the light of the sun or day. When the copy on

the paper is satisfactory take it out of the frame and lay it into the fixing bath until the desired tone is attained. After this wash the copy during a couple of hours in water frequently changed and then dry it. When developing the plate fasten a small rubber clamp on each of its four corners in order to keep the plate from touching the bottom of the basin. The films with two sensitive sides should be developed in a tray the size of which should be considerably larger than that of the film. The developer should be used in large quantities. The films must be carefully washed by rocking the tray gently. In skiagraphy of the thick parts, abdomen, etc., the flexible films properly protected may be applied directly to the body and around the same if possible. In developing, the film should be often reversed to secure equal washing of both sides and to avoid adherence of air bubbles. This manipulation is greatly facilitated by bending two of the corners of the film, one upward and the other downward. The fixing, washing and copying is done the usual way. For the purpose of drying, the films may be suspended by means of clamps in the manner generally adopted in drying of paper prints. It is safest to copy the films in the sun rays to avoid the danger of blurring. In the dark room a ruby lamp should be lighted, but must be perfectly safe. The shutter of the lamp should be closed while the plate or film is being transferred from the envelope or casket to the developing tray. Shutter of the lamp should be so placed that it acts as a shade to the eyes of the operator, at the same time throwing the light into the tray. To prevent inequality of our negatives, the back of the plate is flowed with "Hance's substance of ground glass" and the thinner portions are evened up by rubbing burned umber into the same. The reason for the presence of little more than bone outline in many skiagraphs are under-exposed plates and lack of proper fixation, therefore watch all the steps of the development always very carefully and gradually the sought for image will come into view.

CARE OF DRY PLATES AND FILMS.

Care must be taken not to keep the plates or films in the same room where x-ray work is done. If packed in the paper envelopes, they may be affected on their sensitized surface or any simple scratch will be hidden before the eyes of the operator, beside the possible injury to their keeping qualities. It is better, therefore, to have the envelopes of black and orange colors separately, into which the plates can be readily inserted as required for use in the dark room of ours, and examined before the insertion. Keep the plates in a moderately lighted place which is free from dampness, sewer or illuminating gas or other contaminating odors. The porous nature of wooden or pasteboard boxes in which they are packed is well known. The temperature of the room where the plates or films are kept may vary between 60 to 100 degrees, but the lower temperature should be avoided, as the plates are liable to fog or sweat if the temperature changes from cold to warm, producing mould or scum on the gelatine film, which may be mistaken after developing the plate exposed to the x-ray for pathological conditions, etc. It is always good to see that the oldest numbers of plates are kept forward, to prevent stock becoming too old.

CAUSES OF NON-SUCCESS.

FOG—Film spoiled. The electrical connections not correct and rays produced too weak. Overexposure. Tube not steady and not at its best. White light entering casket, envelopes or dark room; too much light during develop-

ment; unclean trays; developer decomposed; too warm or containing too much carbonate of soda or potassium. Lack of proper fixation. Old plate. Some parts of the dress, especially silk, chamois skin, etc., or other substance more or less opaque to the x-ray, in the way. The radiance in the tube not instantaneously checked when through with exposure. (On the static we can prevent this, as stated already, by laying a metallic rod over the positive and negative of prime conductors and if a coil is used, by watching carefully over switch.) A slight simple fog can be removed by the red prussiate and hypo reducing solution.

WEAK NEGATIVES WITH CLEAR SHADOWS. Underdevelopment.

TOO STRONG WITH CLEAR SHADOWS. Underexposure, or too strong developer.

WEAK NEGATIVE WITH PLENTY OF DETAIL IN THE SHADOWS. Overexposure or too weak developer. Add some of the contrast developer to the normal.

TOO MUCH INTENSITY. Developer being excessively strong or too warm. Negatives dried in warm, sultry air assume more intensity than when dried in a cool place with draft.

FINE TRANSPARENT LINES. Due to scratches with nail or brush.

ROUND TRANSPARENT SPOTS. Air bubbles in the developer.

SPOTS OF IRREGULAR SHAPE. Caused by dust, temperature or sweat of the patient.

YELLOW AND BROWN STAIN OR IRRIDESCENCE OF THE SURFACE. Caused by decomposed pyro solution, insufficient or decomposed sulphite of sodium in developer; using the developer warmer or stronger in alkali than the plate will stand; also by plain hypo solution, which by continued use has assumed a dark color, or by insufficient fixing. The stain may be removed by applying the red prussiate and hypo reducing solution and the irridescent surface can be wiped off with a tuft of cotton while the negative is wet.

MOTTLED APPEARANCE OF NEGATIVE. Precipitation from the fixing bath containing alum, if the solution is old and turbid.

CRYSTALLIZATION ON THE NEGATIVE AND FADING IMAGE. Imperfect elimination of the hypo.

PECULIAR STREAKS AND BLOTCHES. In the shape of brush marks, finger marks and insensitive spots, appearing as though the plate has been scrubbed with a dirty or greasy brush or improperly cleaned, are caused by the uneven action of the developer or using of an intensifying screen of hard grain.

This trouble is more liable to occur if "Hydrochinone" is used in connection with Eikonogen or Metol; when the developer is too old or too much diluted, and can be prevented by a previous soaking of the plate in water, or by radical change to a different developer.

SENSITIZED PAPER. If we wish to make a positive, avoid breakage and printing, we may use specially made Eastman enamelled permanent bromide paper direct instead of a plate. The image appears then in the denser structures, bones, etc., WHITE. The paper in developing requires no special manipulation simply the exposure, development, fixing and washing. If we wish to have more prints, we have to simply expose the required number of sheets of the paper. As far as yet the exposure is somewhat longer in this case, but this and similar difficulties will be overcome soon, when better paper made accurately for our purpose will be put in market. The value and accuracy of the skiagraph, made this way is also

entirely dependent upon the experience and skill of the operator. We have no standard, excepting individual experience at the present time, to determine the proper working vacuum of our tube, and same to determine the length of exposure, when sensitized paper is used, but this method should be ready, convenient and less costly.

While no extravagant claims are made for this procedure, it being too early to assert positive values in every case, we are satisfied of the efficacy of some sensitized paper, especially in field work in military surgery.

In as much as Electricty has shown so much therapeutic benefit, in the treatment of Cancer, yet there are a few Medical Journals in this country that write of it in the negative. The following appeared in the *Carolina Medical Journal*, in November, 1901:

ELECTRICITY.—Electricity, which has promised so much in so many different fields of medicine, and which has practically yielded so little of positive therapeutic value, has been long, faithfully and variously employed in the treatment of cancer. Constant and uninterrupted currents have been applied, electrolosis and cataphores is used, and lastly the influence of the x-ray tested, all with practically negative results.

We are frequently called upon to comment such editorials, and have succeeded in winning over such Journals, that in the present time they are all writing of the x-ray therapy in the positive.

Dr. Eugene Corson presents a very interesting paper, captioned "X-Ray and Photographic Technique Necessary to Bring out Bone Detail in the Print."

A cablegram last week reported that Dr. Addyman in a lecture, delivered that week in London, said he had cured a bad case of cancer, by the action of the Roentgen rays.

Roentgen Society of America.

The next meeting of the American Roengen Ray Society will be held in Chicago, December 10th and 11th, and promises to be the best meeting in the history of the Society. A very fine program, which will be announced later, has been secured, and on it are several of the leading men of Medicine and Science. We will have a manufacturers' exhibit, showing the latest improvements and most approved forms of apparatus. The local preparations are in the hands of a most excellent Committee, as follows:

DR. RALPH R. CAMPBELL, *Chairman*.
414 Marquette Bldg., Chicago.

DR. JOHN B. MURPHY,
Reliance Bldg., Chicago.

DR. LOUIS E. SCHMIDT.
424 North State Street, Chicago.

DR. M. L. HARRIS,
100 State Street, Chicago.

DR. W. L. BAUM,
103 State Street, Chicago.

DR. H. G. ANTHONY,
465 Dearborn Ave., Chicago.

DR. W. A. PUSEY,
Columbus Memorial Bldg., Chicago.

For any particulars or information, write to either the Executive Committee or the Committee on Arrangements.

WESTON A. PRICE, D. D. S.
Chr. Ex. Com.

(*b*) X-Ray Narrative.

The Second of a Series of Articles by Dr. Fred S. O'Hara.

"One of the most amusing instances of the connection of my machine to crime," said Doctor Barsto, at the close of my second visit to him, "happened here about three years ago." I settled myself comfortably in the chair and prepared myself to hear another story, true beyond doubt, in which his Static Machine played an important part.

"To go back to the beginning, it was a worrisome fact that the police knew that there were more Swiss watches in the city than had ever been voluntarily admitted through the Custom House."

My friend Olden had consulted me upon the matter from time to time but there was absolutely nothing suspicious that could be noticed among any of the passengers. All who were suspicious looking had been searched but nothing had been found. Still the watches appeared every thirty days, in regular order, and were as innocent looking as though they had come over in the regular channels. Olden had been detailed upon the case, to help the Goverment Inspector, and at the Customs office he had wearied his eyes and brains, trying for a solution of the mysterious smuggling. He had been there two months, perhaps, before he came to me. After telling me the perplexity he was in, he begged me to "put him on" to the solution of the mystery. I had him to tell me every phase of the case, that he could remember. I asked him where the smuggled property had appeared, and above all I asked him what else that particular firm handled, outside of the jewelry line. After a deep discussion he promised to come again the next evening with a customs list of the importations of this firm. After Mr. Olden had departed I took my case and made a few visits in the city, and then came home to think over the matter, and try for a solution of the puzzle that had caused the officer so many sleepless nights."

"I was very busy next day, and I had completely dismissed the little problem from my mind. When a Surgeon has three or four cases upon which he must operate in a single day, they will give him enough to think about for a few days, and the outside world will trouble him not the least. So I retired that night with never a thought for Swiss watches, nor even Swiss cheese. I was aroused at about midnight by a violent hammering at the door, which I soon opened and found Mr. Olden sadly disarranged in clothing and not entirely free from sanguinary stains. One of his phalanges was broken, and his hand, so well as his face, badly cut up. It took me some little time to eradicate the traces of the encounter, and whilst I was working upon him he gave me the history of his mishap. He had copied off the list of stuffs that were imported by the firm of S—— and S—— that morning, and placed the copy into his hat, for safe keeping. At noon he looked for the list and it was gone. He remembered removing his headgear whilst examining the baggage of a lady that had come over in the steamer that had arrived that morning, but he had not laid it aside for more than five minutes altogether. The circumstance looked suspicious, the more so, because none but the fellow officers were about when the petty theft occurred. However he could not see how they could be connected in any way with the firm of S—— and S——. In the afternoon he had made out another list from the book of registration, this time making a carbon copy beneath the real copy. This copy he concealed in his revolver holster, whilst he placed the other in his hat as before. No one was in the room

at the time, but just as he went into the detention room, he met Detective Sparks, who passed into the room Olden had just quitted. Jack said that he had turned round as the door closed, and a tiny beam of light coming through the door had engrossed his attention for a few moments. Stepping to the door, he could see a tiny peephole that had been cleverly bored, and from which place, the observer could see the desk upon which lay the customs register. Sparks was now looking at that book, as if to make sure what Olden had been copying.

"'I thought that I would give him a run for his money'" said Jack, "'so I hung my hat on a peg, and awaited results. It was easy to conceal myself in the pile of baggage and packing cases that were in the room. After a little while Sparks came into the room. He glanced around casually, whistled a tune as he sat upon a packing case, he leaned back and bumped into the wall with a crash. Of course my cap fell down, and attracted by the noise, he started to pick it up. I arose from my place of concealment, and said 'I'll take charge of that hat if you please.'" He handed it to me courteously, but when I looked for the list copy, both it and Mr. Sparks were gone.

'At quitting time, I repaired to the toilet room, and placed the carbon copy within my shoe. Then I got my supper, and started for here, and here I am, though the worse for wear. After I left the restaurant I noted that there were a pair of tough looking customers in my wake, but I thought that I could "flip them," and I took a roundabout path, that unfortunately landed me in the toughest quarter in the city. Well, you can see the result of the fray, but I know of a couple of men that are in the City Hospital, and are likely to be there for some time, and I did not use my black jack until they had pounded me almost senseless. When I found my hat, I felt a pressure from the inside of the sweat band when I put it on. I staggered up to a light and examined, there was a note, in a strange hand. Here it is.'" I opened the paper that he handed me and this is what it contained.

"'Olden. Keep yer durned hans out of ther custims or ye will get yer dose, worsen this next time.'"

"A light began to dawn upon me. The note was misspelled by intention, and was written with the left hand. And upon heavy ruled bond paper, that must have come from some business house.

"'Search the waste basket tomorrow morning, there in that room where you made your copy, Jack, and you will find the remainder of this sheet of paper, for I could see that it was the work of Sparks, and made when Olden had gone from the room in the afternoon.

"Now for the Importers list. This ought to explain the difficulty we are in. There is evidently a strong reason why this copy is stolen so often though fruitlessly. Nothing looked bad, until I came to silks and satins. "In what kind of packages, do these come, Jack," I queried. "Long, rolled up over a board, replied the late unfortunate." "How thick a board?" "About an inch thick, and a foot wide." "Get a package of that silk and bring it to my office at eight o'clock tomorrow evening. I'll send it back to the house, in as good shape as that in which I receive it, and what is more, you will not need to take the wrapping off." Olden's unclosed right eye, began to twickle with suspicion. 'I see Dock, going to test the bolt with the ray?"

"Bring it, my boy," said I "and we will find some of those dear little Swiss movements, I am sure."

"I will not bore you with the details of how Jack managed to sneak out of the Custon House with a bolt of silk, and how he eluded the men that were in the employ of Sparks, and were upon the

watch for him. Jack will tell you for himself, some evening when you happen to meet him here, (for he comes quite often.) But at a few minutes after eight, next evening, he carried a bolt of silk, heavily wrapped into my office. I darkened the room, connected the apparatus, started the motor, then turned out the lights and awaited the green blush of the tube. I was obliged to reverse the connections, before the tube would work, but soon everything was in fine shape for the experiment. I knew within my very soul, that the thickness of wood in the center of the bolt of silk was for no other purpose than that of concealing something from the watchful eyes of the Inspectors.

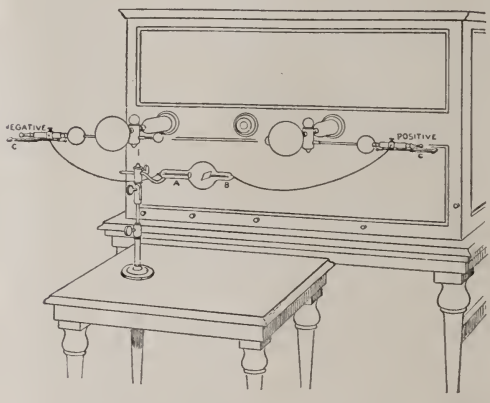
Well, I was honestly astonished at the sight that the tube revealed. Watches packed so closely together, that it was hardly possible to see the light between them. And all in this innocent looking bolt of dress goods. I let Jack take a look, and he whistled in astonishment. "Dock, old boy, you have made my reputation in the past, and it surely looks as though you are going to keep it up for me in the future."

"I bad him think no more of it, and gently dismissed him for the night. However, I admonished him to tell me how the case came out."

He was back next evening with the flush of triumph upon his face. "I am winner," said he "but they fought hard."

"Tell me the denouement," I requested.

"Now to come back to the static machine, I want to tell you just how it was used in this case. This apparatus has twelve revolving plates and they are 32 inches in diameter. It is capable of dis-



charging voltage into the millions, but the quantity of electricity (ampere) is very small. I used this Crooke's tube in this case and the machine was "hitched up," as you see it now. The current at first came in improperly, that is in reversal, and I changed the poles by changing the tube so that the positive current entered the tube at the positive end. It is not

at all in doing x-ray work. The fluoroscope, as you see is so arranged that you necessary now-a-days to darken the room

see the thing you seek without day-light entering or interfering. The bolt of silk was about eight inches thick and the board about one inch. The ultra-violet, or x-rays, or Roentgen ray, as it is called, readily go through cloth and wood, that is, this character of fibre is transparent to the ray. Metal is either translucent or opaque and therefore absorbs the rays. The watches being opaque, no rays passing through, they showed up black upon the screen in the fluoroscope. To get this view I placed the bolt of cloth against the fluoroscope, the tube being six inches from the bolt. The plates of the machine were revolved with electric motor power. I did not require great radiance and therefore had my plates revolving rather slowly for x-ray work. This was controlled by rheostat which regulated the speed of the motor. Instantly I saw the shape of watches, and at once was convinced."

"This morning I told the boss that I had located a part of the smuggled watches," continued Olden, "and for him to have a couple of men at the Custom House to assist me in case I needed them. I sent for Messrs. S. & S. to whom the goods we had examined had been consigned. When they had arrirved, I took them to the detenroom out on the wharf, and showed them their cases of imported stuffs, requesting them to give me permission, to open a few packages, to see that the silks were of standard length. The packages felt so heavy that the length of the piece must have been increased a few yards. The senior member of the firm turned a sickly yellow, and said that he did not care if he paid a little more duty, and that he would prefer that the goods be measured in the store. I assured him that whilst we were commanded to be courteous aud obliging to all those who had occasion to transact business with us, it was absolutely necessary that I open the goods there and then.

In presence of the clerk of the house, whom I had summoned, I stripped the wrapper from the silk. I rapidly unfolded the goods until I came to the wooden core. It was mean of me to do it, but I wanted to prolong the agony for a few minutes, so I laid the board aside and began to measure the silk with the utmost care. I had just about finished the task, when Sparks came into the room, and with a quick glance at the scene of action, walked into our midst. Picking up the board he dealt me a friendly blow upon the gluteal region,

and in an instant, the air was full of Swiss movements. The jig was ended and I called my assistants to arrest the firm of S. & S. who were cringing before me, on the charge of smuggling. And turning to Mr. Sparks I casually remarked, that his little ruse had not saved him at all, and he would pleased to accompany the officers under the charge of complicity in smuggling."

"The whole affair was exposed this afternoon, by confession of the detective, who turned State's evidence to save himself. There was not a bolt of silk nor of satin come in for three yeers, consigned to S. & S. but had been loaded. He confessed to me that he had slapped me with the board to cause the board to break and disclose the concealed articles,

and at the same time prove his entire innocence, but I was too much for him, and he cheerfully admitted the fact.

The thugs that waylaid me, were to frighten me, and incidentally load my hat with the cheerful little message, which I heeded not."

"Jack looked triumphant as he sat there where you are now sitting, lighting his cigar. After he had finished his story. He thanked me warmly for the interest I had taken in the case, and queried what an x-ray machine like mine would cost, as he was thinking about buying one for his individual use." "I am tired of bothering you so much" said he, "but in the future, no case will pass by me, that is not probed by the x-ray.

"I thanked the Doctor warmly for his story and bade him good night, for I knew that he was tired and sleepy. My disease was gradually yielding to his skill and care, but I made up my mind that sick or well, I wanted to hear some more of his narrations of Mr. Olden and himself, in the field of crime.

SPRINGFIELD, ILL.

The AMERICAN X-RAY JOURNAL (St. Louis) for May comes in a new dress with the name of Chas. P. Renner, M. D., as editor, Dr. Heber Roberts presumably retiring. However, from appearance one would think "it is the voice of Jacob but the hand of Esau." Bro. Roberts will undoubtedly be still heard thru this ever-interesting journal.—*Journal of Gynecology and Surgery, St. Louis.*

We thank you, Bro. Lamphear, for this notice and trust you may award us with more extended ones later on. Matter of x-ray interest we will gladly read in your most valuable journal.

When you read, let the selection be light, which will avail you something useful.

Dr. Kellogg, of the great Battle Creek, Mich., Sanitarium, has purchased the static machine, formely owned by Dr. Gardner of Washington, D. C. This machine was made by Waite & Bartlett Manufacturing Co., and is the largest machine of the kind ever constructed. The best authority is a unit of the opinion that a medium can not be too large for static currents. A million volts seems sedative or stimulative just as it is used. The greater the voltage the better the patient feels, provided the amperage remains insignificant. But this machine was too bulky for Dr. Gardner's office, and Dr. Kellogg who knows a good thing when he sees it, has ample room in the many apartments of the sanitarium for this big apparatus.

All sources, facts from all languages concerning radiant light gravitates into the AMERICAN X-RAY JOURNAL. Can an operator with a machine, and especially if he treats patients, be faithful to his trust if he does not read the AMERICAN X-RAY JOURNAL?

The autopsy on the late Dr. Christian Fenger confirmed a diagnosis made by skiagraph last fall. At that time Dr. Fenger had an attack of colic, which he thought might be due to gallstones, and a skiagraph taken, showed small, dark shadows in the region of the gall-bladder. At the autopsy, three gall-stones were found in this viscus.—*Exchange.*

Dr. Frank Alonzo Kirby, and Dr. C. E. Skinner of New Haven, Conn., report a case of round-celled sarcoma, successfully treated by x-ray exposures, after some of the eminent surgeons of the east declared it inoperable.

Dr. George Hopkins of Cleveland, reports a case of stone in the bladder, the presence of which evaded every conformatory means known to the profession, until the x-rays were brought into requisition.

X-Ray Therapy.

Read by request by H. P. Pratt, M. D., before the State Eclectic Medical Society, Chicago, May 21st, 1902.

X-ray therapy and electro-therapy are fundamentally the same, and the good results obtained are due to ionic changes in the tissues, or electrolization the body acting as an electrolyte.

Over six years has elapsed since the therapeutic value of the x-ray was first discovered, and hundreds of patients have been treated with this force, with varied results, no two experts agreeing on any one method of treatment. It has been somewhat of a go-as-you-please affair, and as only a few had any understanding of the nature of this force, it was hit or miss, and by far more misses than hits. The bulk of the work done in this line has been within the last year. It almost seems now that every physician and electrician who has enough money to purchase an apparatus for the work, is posing as an expert, and is treating patients without the slightest knowledge of, or experience in, this line of work. These supposed experts, after six or eight weeks of experimental work, send reports to medical journals with pictures taken before and after of a patient that they succeeded in curing of "lupus" or "epithelioma;" when, in fact all the time they were giving potassium iodid. On the other hand when they come across a genuine case of lupus or cancer they fall down. This kind of work is what has given a black eye to x-ray therapy. In the hands of a genuine expert, (and these are very scarce), excellent results can be obtained.

We must not be carried away with the idea that the x-ray is a cure-all. If we do, we will very soon discover our mistake. It has its field of usefulness, and a great field it is, too. We also must allow time for recurrences, for we will certainly have them. But if all the reports published in the different medical journals, both here and abroad, prove to be correct, then there must be a radical change in some of our surgical procedures. Time will tell.

I believe it was the celebrated Dr. Agnew who said: "I do not remember a single case of cancer operated on by me that was cured." Since then a number of surgeons have expressed themselves in a similar manner. Now if this is true, why do they operate? They say it is simply to take away the mass of infectious material to prevent further absorption of the septic mass, to prolong life, not to cure the disease.

So long as the knife is used, so long we will be kept in ignorance of a rational treatment. If the surgeon would refrain from cutting until it is necessary, then it would give an opportunity for the study of other methods. I am not posing here as a surgeon, nor do I claim to know anything more than the average practitioner about surgical procedure, but I have some knowledge of x-ray therapeutics, having in the last six years given over 25,000 treatments.

The force from the x-ray is electric in character and of a very high potential. It acts on matter in the same manner as any electro-motive force, that is to say, it produces a dissociation of molecules along its lines of force, meaning ionic changes or electrolysis. All substances through which the x-ray passes form part of the x-ray circuit. The body is part of the x-ray circuit, and is an electrolyte. I want to say right here that the x-ray is not of itself and directly any more a germicide or bactericide than the sun. We depend entirely upon the ions liberated through the electrolysis of the tissues and contained materials, which bring about a splitting up or decomposition of the bacteria or the cancer cells.

This is why it is very essential to properly feed your patients and give them the class of remedies which are active and readily decomposed, so that the free ions will attack and decompose the bacteria, or assist in destroying the cancer. My theory is that the body, which is composed mainly of 15 of the 80 odd elements, each element is an independent center of force; that it is the association of one element with another which gives to us all forms of matter known as compound; that all physiological changes are due to the difference in the electrical pull of the ions; and that when the x-ray is applied to the body it decomposes the compounds into their elementary structure, and recombination takes place in the direction of the stronger electrical pull. This theory of the difference of electrical pull was advanced by me and published in the Alkaloidal Clinic, November, 1899, and in the Annual Eclectic Medicine and Surgery, Vol. VI, 1895.

I do not question that the x-ray is antiseptic; but it is not a germicide or bactericide unless there are enough ions liberated through electrolysis to bring about a decomposition of the bacteria or the cancer cells. In the bacteriology of Lehman and Neuman on page 29 is given the chemical composition of bacteria, which is almost identical with that of the tissues of the human body. It is highly probable that the composition of the protozoon of cancer is similar.

The therapeutic properties of the x-ray may be summed up as follows: 1. The x-ray through the liberation of the ions, hastens physiological changes, or metalbolism, causing a temporary rise in temperature and an increased elimination of waste products by the lungs, skin and kidneys; at the same time increasing the activity of the phagocytes. 2. The x-ray is an antiseptic, due to electrolytic changes producing ozone. 3. The x-ray is a germicide and bactericide only through the liberation of the ions (which is electrolysis) along its lines of force.

The x-ray treatment is not the only electrical treatment used for cancer, but I think in time it will be more potent than the other method. The well known Parson's method, which has been in vogue for the last few years, seems to be very effectual and has, in comparison with the knife, a less number of recurrences. It consists in passing a heavy current through the body of the cancer by means of platinum or gold needle electrodes for several seconds. It is known sometimes as the flash method. The patient must be under an anesthetic, as the treatment is very painful. A current of from 300 to 600 milliamperes or more is used. It is not strength of current that kills the cancer cells; it is the current density, corresponding to an increased number and concentration of the lines of force within a given space. Wherever the lines of force strike the cancer even with a reasonably weak current it will decompose that portion of the cell. This is accomplished much more readily by the x-ray, as there are a large number of lines of force thrown off from the tube.

The reason why the Parsons method is not practiced more is because it requires an expert electrician to manipulate it, and it is painful as well as dangerous.

During the excitement following the discovery of the x-ray, and especially after its therapeutic properties were discovered, I was flooded with inquiries relating to its use. I at that time had material to work on; so, on April 13, 1896, I placed under the ray two patients suffering with cancer of the stomach. I did not expect marvelous results; in fact I did not know what to expect. I

treated them daily for over four weeks and was surprised to find out how quickly the x-ray relieved them of pain. One of the patients had hemorrhages every three or four days. They ceased after the third treatment. These patients came to me without knowledge of their physician whom afterwards they consulted. He advised immediate operations. In all probability they were operated upon and are dead by this time. It was almost impossible at that time to secure other patients suffering with cancer, for every surgeon advised operation as giving the only hope of relief, so it was not until later in the year that I managed to treat a few private patients who would not be operated on and who were referred to me by their family physician. In April and May, 1896, I treated quite a number of patients suffering from tubercular troubles, namely, pulmonary tuberculosis, and tuberculosis of the glands, joints, etc., some of whom died and some are living today. Some of the case were reported by Dr. Finley Ellingwood in the Chicago Medical Times of July, 1896.

From the fact that these and other cases have already been published, I will confine myself now to a few typical cases since that date.

On June 8, 1896, Dr. John B. Murphy of Chicago, referred to me for treatment a patient suffering from Lupus Vulgaris, with the following letter: "Why are you trying to treat pulmonary tuberculosis before you undertake to treat the simpler form, that of Lupus Vulgaris?" The patient continued treatment for about three months when she was discharged as cured. This is without doubt the first case of lupus treated and cured with the x-ray.

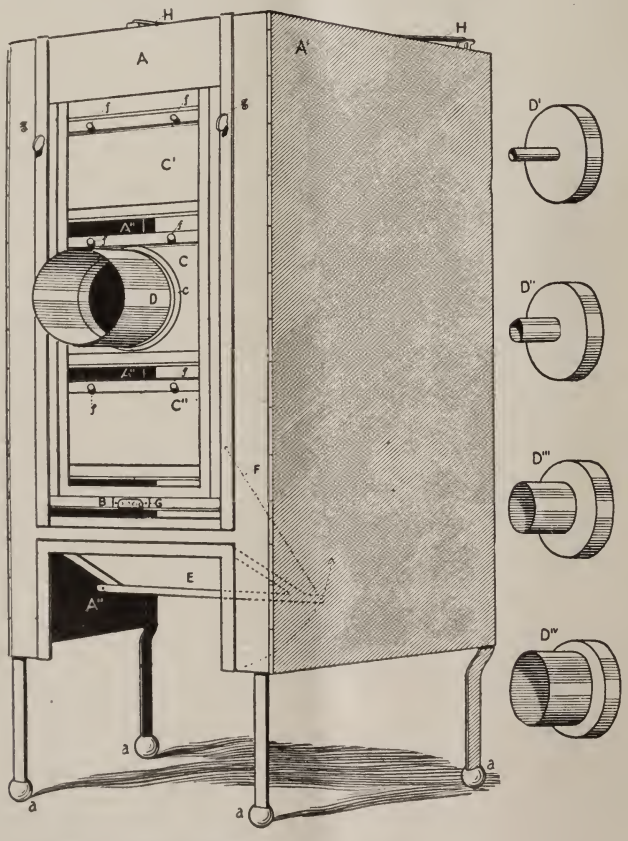
On October 21, 1896, Dr. Finley Ellingwood referred to me a patient suffering from tuberculosis of the kidney. She was discharged cured by the doctor in about four months. There was one thing peculiar about this case that after each treatment the patient had quite a severe hemorrhage from the kidney. I learned through Dr. Ellingwood a short time ago that she is in good health—absolutely well.

Miss A. was referred to me by Dr. Ochsner, the family physician being Dr. John Bartlett of Chicago. The patient was operated on by Dr. C. W. Johnson at the Swedish Home of Mercy on November 20, 1900, for what was supposed at the time to be an abscess of the bon A microscopical examination was made at the Rush Medical College, and the slides are in the possession of Dr. C. H. Parks with diagnosis that it was a small round-celled Osteo-Sarcoma. The x-ray treatments were given three times a week from January 12, 1901 until March 12. She left the hospital on March 14, was taken home and sent from there to the Passavant Memorial Hospital. March 26, 1901, the limb was amputated by Dr. Fenger and on June 27, 1901, another operation was performed. The patient has fully recovered and there are no symptoms of any recurrence of the Sarcoma. The question is whether in this case the success was due to the method of treatment, first using the x-ray as we did for a certain period of time, then following that up with an operation, with treatment after. All the surgeons that examined the case and followed it up from the first agreed that if it had not been for the x-ray the patient would not have lived; and even Dr. Fenger, I understand, concurred in this opinion.

I have under treatment a number of cases of Sarcoma, two or three of which have been cured, but they were taken in time. Another has been under my treatment for over six months; she is no worse and I think she is getting a little better. The surgeon that referred

the case to me for treatment informed me that if it had not been for the x-ray she would have been dead before this, and if he had operated it would have recurred, and death would have followed very closely.

Now by utilizing the x-ray, and with the judicious use of the knife, we may be able to control malignant troubles heretofore incurable. I think that if we take for instance Carcinoma of the stomach, treat it with the x-ray for a certain length of time, operate on the patient for the septic mass which has been destroyed or partially destroyed, in order to prevent further absorption, and use the x-ray afterward for a period of several months, we may be able to cure internal cancer. The object of the operation is to take away the mass of septic material which is poisoning the system. This will also hold good in all the other cases where a mass of septic material is present. I will say here as a final conclusion that all superficial cancers, as well as Lupus Vulgaris, can be successfully treated without the use of the knife. I am very much inclined to think that it is advisable on all deep cancers to use the x-ray and then follow up the treatment with a radical operation, following this with the x-ray for several months. It is necessary in all cases, whether of a tubercular or malignant type, to give the necessary medicine to assist nature by supplying her with sufficient material to assist the x-ray to do its work. In the treatment of tubercular glands, I am in the habit of using a celluloid screen with a 10 per cent solution of creosote to be applied to the gland. This celluloid screen is an invention of Dr. Alexander Weiner of this city and it takes the place of col-



lodion as a form of dressing in treating tubercular cases. Where there is a persistent cough a 5 per cent tincture of opium in combination with the creosote can be used. The x-ray facilitates the absorption of the remedies. This is known as Cataphoresis.

Clinically the effects of x-ray treatment of a malignant tumor are as follows:

1. Relief of pain,
2. The growth of the tumor ceases,
3. The edges and surface soften,
4. It decreases in size,
5. Adhesions are reduced so that the tumor becomes moveable,
6. The whole mass becomes elastic to the touch, softens, and
7. Gradually disappears.

During treatment by the x-ray a metallic screen should be used large enough to protect both patient and operator from any injurious effects of the rays.

(This paper was accompanied by demonstrations, the apparatus for which was provided by Nafis & Co. and Frank S. Betz & Co., Chicago.)

AN X-RAY SCREEN.

In treating patients for malignant growths in which frequent and prolonged exposure is required, some efficient means of protecting the healthy tissues is absolutely necessary.

The operator himself if exposed repeatedly to even a mild amount of the x-radiance may suffer considerable injury, as many experimenters have found to their cost.

At a recent meeting of the Chicago Electro-Medical Society, Dr. H. P. Pratt exhibited a screen designed for the protection of both operator and patient. The screen is made of sheet steel and can be folded into small compass when not in use. It consists essentially of a vertical sheet steel frame, A 1½ meter high, ¾ meter wide, supported on feet a,a, with two steel wings A′ A″ of the same size; steadied at the top by two braces H. At the bottom of the frame A is a hinged door E, supported by a chain F, which is for the purpose of protecting the feet and knees of the patient when he sits facing the machine.

In the frame A, is a window with a vertical sliding front B, with its handle G, and set screws g, g. This sliding front contains three sliding shutters C, C′ C″ with knobs f; in one of which is a flanged opening 20 centimeters (8 inches) in diameter. Over this flange c, is fitted one of five interchangeable caps D, D′ D″ D‴ D⁗ each with a circular opening to which is added for convenience a flange. The openings vary in diameter from 2½ to 15 centimeters (1 to 8 inches) and enable the operator to confine the rays to the region in which an exposure is desired.

Behind the sliding front it fitted a transparent celluloid sheet ⅛″ thick, filling up the whole window. This sheet is between the tube and the patient during exposure and prevents the projection of particles of dust and other septic matter from the outside of the tube to the surface of the patient's body.

Since using this protection Dr. Pratt has had no trouble on account of x-ray burns, even in cases in which exposure has been pushed to an extreme degree in order to destroy malignant growths.

Dr. D. J. Hayes presents a neat paper on the Diagnosis of stone in the Bladder, Kidney and Ureter, by the x-ray, also presenting three radiographs, which show remarkably good results. The writer strenuously points out what the successful use of the x-ray has done away with, the necessity of a diagnostic incision for renal and urethral calculus with its risks, which heretofore has been the mode.

Dr. G. H. Rodman and Dr. T. C. Squarice report cases of long standing Lupus Vulgaris treated by the application of the x-rays.

X-Ray Divergence Chart.

SUPPLEMENT TO

A System of Instruction in X-Ray Methods and Medical Uses of Light, Hot-Air, Vibration and High Frequency Currents.

By S. H. MONELL, M. D.

Students of X-Ray work should study this chart reprocuced on the front cover of this Journal.

This chart shows at a glance the following points of essential interest to the X-Ray operator:—

1. A Plane Diagram of X-light radiations from the *anode* focus-point.

2. The rate of departure of X-Rays from a parallel path at different distances from the tube.

3. The proportionate loss of right-angle shadows at different distances horizontal to the perpendicular axis.

4. The area of non-distorted field of observation at any distance from the tube.

5. The area within which a body of any thickness will shadow a right-angled relation of the parts at a given distance from the tube.

6. The distance from the tube at which a part and the photographic plate must be exposed to secure essential correctness and non-distortion for a diagnostic field of any given size.

7. The general area of approximate non-distortion on the plate.

8. The obliquity of shadows at all distances outside of the central field of exact perpendicularity of radiation.

The scale of the Chart reads down from the focus-point of the tube to an imaginary plate twenty inches distant. For greater distances, extend the indicated lines below the Chart, and apply the same rale of interpretation. For full explanatory description see Chapter XVIII.

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Address communications to Dr. H. Preston Pratt, Managing Editor, Masonic Temple, Chicago.

H. PRESTON PRATT, M. D.,

Masonic Temple,

CHICAGO, ILL.

THE AMERICAN
X-RAY JOURNAL.
Devoted to Practical X-Ray Work and Allied Arts and Sciences.

VOL. XI. ST. LOUIS AND CHICAGO, AUGUST, 1902. No. 2.

Publishers' Announcement.

The American X-Ray Journal will devote its columns to the education of the medical profession in X-Ray and Electro-Therapeutical Practice.

This includes (a) X-Ray Diagnosis, both medical and surgical, the methods of fluoroscopic and photographic examination, of locating fractures and dislocations, renal and hepatic calculi, aneurisms, abnormal conditions of the heart, tumors, tubercular diseases, malformations, etc.

(b) X-Ray Therapy, treatment of cancer, tuberculosis, diseases of the skin, etc., etc.

(c) Electrotherapy of acute and chronic diseases as follows: Mental and nervous; diseases of the heart, lungs, eye, ear, nose and throat; gynecology, obstetrics, genito-urinary diseases, diseases of children; skin, liver, kidney, rectal and intestinal disorders; by such methods and apparatus as should be at the command of every practicing physician and surgeon.

(d) Dental diagnosis and treatment.

X-Ray and Electro-Physics, insofar as they directly concern the physician and surgeon; new forms of apparatus and investigations into the nature of the forces used; will receive their full share of attention.

As far as practicable each number of the Journal will contain articles in each of the following departments:

1. Scientific and original articles for advanced workers.

2. Clinical reports of x-ray therapy and electro-therapy. Every physician, no matter what school he belongs to, is invited to send for publication reports of his cases treated with the x-ray or electricity, not exceeding two hundred words. State exactly what you did, how you did it, and the results, and the Journal will be glad to give you the space.

3. Editorial News and Notes, giving the latest news in x-ray and electro-therapeutics from all parts of the world. Translations from foreign journals will be made by the members of our own editoral staff.

4. Queries answered by well known specialists.

5. X-Ray and Electro-Therapeutical Practice; papers by the leading specialists both here and abroad.

6. Lessons for Beginners, a complete course, consisting of 24 lessons, under the auspices of The Chicago College of X-Ray and Electro-Therapeutics, on the principles and practice of x-ray and electro-therapeutics. No physician can afford to miss this course. It is worth $100 to any practitioner.

We will expose fraud and charlatanism wherever we find it, and will exercise the utmost care to see that everything that enters the pages of the Journal is thoroly reliable. Truth is what we seek and truth we welcome from every source, giving credit where credit is due, without fear or favor.

The Journal will be enlarged as rapidly as necessary to meet all requirements. The subscription price will remain the same as heretofore; $3.00 per year in the United States, Canada and Mexico; $4.00 in foreign countries. Single copies 50 cents.

Practical X-Ray Diagnosis.

Prepared by J. Rudis-Jicinsky, A. M., M. D., M. E. Cedar Rapids, Ia. Revised by M. U. Dr. Joseph Hoffman, Vienna, Austria.

A series of A B C teaching for workers in x-ray diagnosis and therapeutics, to be concluded in 20 lessons. Fully illustrated.

Fluoroscopy.

LESSON X.

The property of the Roentgen rays of producing an intense light on a screen covered with fluorescent matter is the basis of fluoroscopy. If bodies which are opaque to the x-rays, such as the bones of the human body, are placed before the screen, their contours may be seen with surprising distinctness, and not only the shadows but the substance of the bones may be studied satisfactorily. Cartilage, which is practically transparent to the rays, gives us a marked line on the shaft of the bone, and the presence of any earthy salts in the cartilage enables us to detect the very early beginning of ossification, before the knife and the naked eye can detect them with all the data put down in our standard text-books.

The best screens are those prepared with barium platino-cyanid. The cyanid has to be crystalized and re-crystalized before the cardboard is coated. Afterward a protecting varnish must be applied and material of very fine grain used. Screens so prepared are not only more brilliant, but having finer crystals show small details of the fluoroscopic image to better advantage than calcium tungstate screens. Every exhausted tube can be used for screen work, but thick parts of the human body can only be observed with first rate vacuum tubes excited by a powerful induction coil or a good static machine. In cases where it is impossible to completely darken the room or where we are after the minute details of our image, not a screen but a fluoroscope must be used.

The fluoroscope designed by Edison consists of a flaring box, curved at one end to fit over the forehead and eyes like a stereoscope. The end of the box is closed by a pasteboard cover in a frame, removable or not, on the inside of which is spread a layer of tungstate of calcium, or of barium platino-cyanid. (Fig. 1.) By placing the object to be observed, such as the hand, between the vacuum tube and the fluorescent screen of the fluoroscope, the shadow is formed on the latter and can be observed at leisure. With proper understanding of the nature of these shadows cast upon the fluoroscopic screen or the photographic plate, it soon becomes easy with experience and a little practice of the operator, to take in the pictures at a glance. To make a correct diagnosis, we have to remember that we are dealing with shadows, and require more than one point of view to judge properly. A shadow has but two dimensions and a second shadow at right angles to the first becomes necessary to give us the three dimensions. When the proper conditions are known the x-ray cannot deceive, its revelations are infallible. Just study a little the shadows of your hand on the wall and light in front and get aquainted with the fundamental laws of physics in this case, remembering that the pathologist cannot interpret his microscopical findings if he does not know his normal histology. So with the

fluoroscopy, the skiagrapher has to know and must have before him the normal skiagraph before he can make his diagnosis and interpret properly the abnormal conditions.

In making an examination the observer should increase his sensibility to the light by remaining some minutes in the dark before using the fluoroscope. The part to be observed should be placed before the fluoroscope, as near as possible, until the picture of the bones is quite distinctly seen. And let us state right here that the bones are the best guides in fluoroscopy for differentation in examination of different qualities of the rays. When the room can be darkened an open fluorescent screen may be used, large enough to enable one to observe the chest. The beating of the heart, movement of the diaphragm, etc., may be seen with surprising distinctness. In observing the chest use a tungstate of calcium fluoroscope first, and take care that the patient should not be placed too near the tube, lest the heart appear enlarged upon the screen. When it is required to render the rays from the tube invisible, cover the tube with a black cloth. In many cases, such as when search is made for a foreign body, photography is better than observation by the screen. For examining the beating of the heart, etc., on the contrary, the screen is to be preferred, especially a flexible screen with which we obtain equality of definition and intensification in our image.

The changes in the form of the heart, for instance, as we notice them thru the fluorescent screen, are quite similar to those which we have on the corresponding skiagraphs, yet there is a slight difference that we are able to observe the immediate effect of any deviation or abnormality, while during the taking of a picture certain delay must needs take place. The screen certainly permits more than one person to observe the x-ray picture at the same time in a darkened room. Screens are flexible or mounted in wooden frames, if we wish too with protecting glass over the film, and can be either stood upon the table or suspended before the tube. In making observations with the screen, take care not to place the patient too near the screen or electrical connections, to avoid the danger of receiving shocks from apparatus. A distance of two or four inches suffices for avoiding this. The more the room is darkened, the better the picture will appear on the screen. It is also necessary to first accustom the eye to the darkness, as stated already.

All workers in Roentgen photography have experienced failures more or less. Apart from such causes as mistakes in the arrangements of the apparatus, or inefficiency of the same, cases occur in which no reason can be assigned for the failure other than the inefficiency of the x-ray tube. Judging the efficiency of a tube is, however, by the methods hitherto described, a venturesome matter sometimes. The manner of testing was by placing the hand against the fluorescent screen beneath a fluoroscope or in a dark room, and being satisfied with the tube on seeing the bones of the hand with distinctness. But, as the hand is a very thin object, this effect is secured by tubes of very medium efficiency. If by the introduction of more current the efficiency of the tube be increased, the picture of the hand upon the screen would not improve, because the rays would now penetrate bones. For this reason something different from the hand must be chosen for an object test. Such an instrument is the skiameter; a fluoroscope to which a system of tinfoil tablets, together with a

numerical scale is applied against the fluorescent screen. The screen is divided into squares, with numbers of lead, which appear dark. Each individual square is furnished with an increasing number of tinfoil leaves or tablets. The field No. 1 is kept clear, No. 16 has a layer of 15 tinfoil leaves, which have a combined thickness of 0.65 millimeters. As the distance of the screen from the tube is an essential factor a funel-shaped tube is placed upon the former against the aperature of the skiameter. In my laboratory I have used for testing the tube a simple frame of tinfoil squares around a large empty square for observation, comparation and differentiation of different shadows, which appear upon the screen of a common fluoroscope. The frame is laid against the end of the box, closed by a paste-board cover, and observation and the differentiation may be made with the examination proper. The tinfoil leaves may be pasted on a cardboard frame with a large square opening in the middle. In this middle opening we have our image examined, which easily may be compared with the shadows of the small squares of tinfoil around, marked with small holes, one, two, etc., according to the thickness of the tinfoil layers. If, in photographic exposures the distance of the platinum reflector in the tube and the efficiency of the tube according to the number shown on our frame or in the skiameter be carefully noted, one will, under like conditions for the same object or bodies, obtain like results. In our laboratory we obtained a picture of the buttocks of a very strong lady by a tube by which the number 12 in our frame or skiameter was distinguishable, in three minutes. The distance of the platinum in the tube from our dry plate measured 80 centimeters. The experiment was made with a static machine, ten plates, with a dry plate coated on both sides and placed between two intensifying screens. Beneath the patient lay a leaden box constructed for this purpose, and in the casket a layer of lead about half an inch in thickness was placed under the plate The experiment was a success.

How to take a Skiagraph.

LESSON XI.

In describing a method of taking an x-ray picture, radiograph or skiagraph with the Crookes tube working at its best, it makes no difference whether a 1-inch or a 20-inch induction coil, static machine or another apparatus is used for generating the x-rays in the tube, the method of operation is in every instance the same and without a camera. A simple object, metallic or any other, is taken in the same manner as the chest of a man; it is only a question of degree of the penetration.

For the beginner in x-ray diagnosis it is always good to select for the first exposure an object which is easily taken, and gives a good opportunity to study the different layers of the muscles, ligaments, bones, the internal structure of the same, cartilages, and their relations in the living body. Such a subject is the human hand, which gives different shadows for comparison and may be skiagraphed in a few seconds. For simplicity of description we will suppose that we are now ready to proceed. We take our casket containing a dry plate, say Cramer's, made expressly for x-ray work, whose film side is turned upward. The plate must be put into the casket in the dark room, or we may insert it into two envelopes furnished by the manufactures. This procedure must be done very carefully. The envelopes have the advantage of bringing the objects exposed

a little closer to the dry plate. The hand is laid in the desired position, the side to be observed more fully as near as possible on the plateholder or over the envelopes, and fixed immovable (with adhesive plasters, if necessary). If we would like to have a picture of the internal structure of the bones also, we enclose an intensifying screen of very fine grain in the envelope against the film of the dry plate. That has to be done in a dark room, too. Our Crookes tube being about 12 inches or more from the plate is put with all our apparatus into operation, presuming that our machinery is in good order, and all electrical connections properly made. The tube must be in position over our object and the disk of the anode so situated that the exposure takes place under the most beautiful radiation of the green field seen on the glass walls of the tube when excited. After a certain time of exposure, guided by previous experience and fluoroscopic examinations, the apparatus is stopped at once, the coil by the switch, the static by a metallic rod laid over the primary conductors, negative and positive, and the exposed plate carried into the dark room for development. As you see, the modus operandi is very simple, and as stated above always the same, but practice and experience are necessary just as well as in other methods of diagnosis.

We have to have in mind that each particle at the moment of bombardment in our Crookes tube become a source of x-rays, and that the more particles we have in action the greater will be the quantity of rays. If we vary the intensity of bombardment per particle in the x-ray tube we get different degrees of rays or, as we can put it, certain variation in the range of the ultra-violet rays or change in the wave-length and vibrations per second, giving us rays varying from those with great differentiation and very little penetration to very little differentiation and great penetration. Therefore the greater the intensity of our current and the more particles in action in our tube the greater and better the quantity of our rays. To have good contrast on our photographic plates or on our fluoroscopic screen, in making a skiagraph of certain part of the body or in observing the same, we must have a certain intensity of bombardment per particle in our tube, and to get short exposure we must have a great quantity of rays, the former the result of our current and the latter that of the number of particles in action.

In making an exposure for a picture the further away we place the tube from the plate and the closer we place the object to be skiagraphed to the photograpic plate the better definition and contrast in the negative we will get. If the tube is held close to the part exposed, or if the part exposed is held away from the dry-plate, the resulting negative will be magnified and distorted. But we have to remember that each individual case requires special attention, and that the distance between the tube and the dry-plate principally depends upon the thickness of the body or object to be photographed. A distance approximately taken in a person weighing 150 pounds would be as follows:

Hand and wrist, duration of exposure, 30 seconds, at the distance of six inches from the plate; 45 seconds suffices for photographing the forearm at the distance of 6 inches. The arm above the elbow will be taken at the exposure of one minute at the distance of 10 inches; shoulder, one minute at 18 inches; thorax, 3½ minutes at 20 inches; hip-joint, 5 minutes at 22 inches; knee, 3 minutes at 13 inches; foot, 2 minutes at 14 inches, etc., without the intensifying

screens. The greater the distance, the longer is the necessary time of exposure. In photographing chest and bosom, corpulence and age of the respective persons, as stated above, should be taken into consideration. For reducing the time of exposure still more to seconds instead of minutes, intensifying screens are used, to which we shall again refer. Using the above distances please do not consider them as a pattern, but take care of your case and you never will produce any irritation or dermatitis, and your exposures will be sufficient to give satisfactory results. A long exposure should never be made with a low vacuum tube. It should not exceed 30 minutes and the distance must be proper.

In my experience I have worked one and the same tube for certain delicate fluoroscopic and photographic work at its highest state of efficacy, when the platinum reflector in the tube was red, and sometimes at white heat, watching for the vacuum not to be unduly lowered and found out that the quality of the rays varied with the resistance of the tube. In directing the tube to the object take care that the platinum reflector is held parallel to and centrally over the dry plate, see that the machinery is in order, the electrical connections properly made, and the wires leading from the coil to the static do not touch the glass walls of the tube, for fear of the perforation of the tube by the electrical discharge. It will be found very handy to seal the eyes or loops of conductors outside of the tube with common lead fuse wire, staniol, or oil silk, to prevent leaking. The wires leading from the secondary terminals of the induction coil or the static machine to the Crookes tube should be well insulated and covered with rubber tubing. By these and other manipulations the best x-ray produceable by a given tube and a given apparatus may be made quickly available and the penetrative force regulated; but we have to have always in mind that the length of exposure depends not so much on the time during which the tube is in action, but upon the actual time of best x-ray production. And in this green x-ray field, tested occasionally by means of the fluoroscope, we have to work—and sometimes accomplish most beautiful results.

Always know your technique, your apparatus, your Crookes tube and its quality, the power of your x-ray, the distance of the tube from your object, the distance from the photographic plate, which must be as near as possible to the part examined, remembering that the shadows which are seen most beautifully correspond exactly with the radiation from the disk of the platinum in the tube; know and regulate the duration of exposure; and mark the angle at which the picture is taken. If you wish to make a correct diagnosis and produce an accurate skiagraph, you must never be satisfied with one picture of the case, but make it also your duty to produce different skiagraphs from different points, taking at least two skiagraphs perpendicular to each other with the help of the fluorometer, comparing the same, and the injured part with the normal one. Our work must be rapid, exposures short, and the patient, if necessary, protected with few layers of staniol on parts not examined, or an aluminum screen interposed between the tube and the patient, and grounded as advised by Tesla. This is done especially in prolonged or repeated examinations, but should not preclude the taking of other precautions. To read correctly the lesson of an x-ray picture, know your individual case, your anatomy and pathology; keep the obliqueness of the x-rays in mind, and make the skiagraphs as nearly life-size

as possible to get sharply defined outlines, using a proper intensifying screen of fine grain if necessary, and a fluorometer or a dividing screen for measurements and exactness of your negatives, which have to be marked properly with your name, made in wire and laid on the plate before exposure, and all necessary data for identification and record. In the corner of each picture, make it a rule to mark the power of the spark used, say, "Spark 12 inches;" the distance of the tube from our object, "tube 8 inches;" the distance from the sensitive plate, "plate 12 inches;" film or paper; duration of exposure, "exposure 10 seconds;" the angle at which the picture is taken, "36 deg.," etc., or simply: "S 12, T 8, P 12, E 10 seconds, 36 deg." All these letters and numbers are made in wire and laid on the plate before the exposure. And if we mark also the right and left side of the object taken, with "R" and "L" there hardly can be a possibility of any deviation, especially when the fluorometer is used to correct any distortions with mathematical accuracy. Then you will make sometimes skiagraphs which really will be most wonderful, will secure you the best consultants, will protect you for the future and show you what to do in the proper way.

Static X-Ray Generators.

By Dr. John T. Pitkin.

The fluoroscope through which I invite you to look is nearly new, hence a suitable medium for the investigation of the quantity, quality and general properties of the Roentgen rays.

Time and use cause a fluoroscopic screen to become dingy, dim, of a darker shade of color, and to fluoresce imperfectly under the x-ray stimulus, calling for renewal semi-annually.

This fluoroscope is of the conventional form with removable platino-cyanid of barium screen 6x8 inches in measurement.

The Crookes tube to be excited is of a medium size, German type, having, when cold, a resistance equal to a 3-inch air gap between discharging rods of a static machine tipped with balls 1½ inch in diameter in a July atmosphere.

In order that the look may be worthy of your valuable time, I will excite the tube with the current from a static machine having twenty-four revolving dics and another machine having twenty-two revolvers; the two generators will be operated in multiple relation to each other, i. e., forty-six wheels will work harmoniously in the generation of the lightning current.

The same laws that govern the wiring of batteries or connecting dynamos in the multiple relation to each other to increase the volume or amperage of the the current are applicable to high potential apparatus.

Some three years ago in the columns of this valuable Journal the writer described how we were then operating a twelve and an eight revolving plate Waite and Bartlett static machine for their combined action upon the Crookes tube.

This we accomplished by attaching an extra pair of prime conductors to the posterior surface of one instrument. These structures were electrically connected to the anterior prime conductors of the other generator.

Each machine was operated by a separate motor. A more simple method now employed consists in placing two machines side by side, their neighboring prime conductors are charged negatively and connected to each other by a short brass chain. The more remote

prime conductors are given a positive charge and electrically connected to a long brass chain suspended high in the air from the arms of the standards usually employed in the treatment of patients by static electricity.

To avoid the electrical charging of the apartment, its inmates, etc., and prevent unnecessary loss or modification of the current the standards used as poles are placed upon insulated platforms.

Both static generators are operated by a single shunt wound motor having a pully with two deep grooves.

Under varying loads resulting from resisting tube, spark gaps, condensers, etc., a shunt wound motor has a more constant speed than motors of the series wound variety. Shunt winding calls for an extra rheostat in the armature circuit.

Deep grooves in the pulleys lessen the tendency of the belts to fly off when the apparatus is run at a high rate of speed. If the grooves in your pulleys are shallow you can deepen them by holding, with pressure, a round file of suitable size in grooves while apparatus is running.

The subject of dynamos, motors and dynamotors has been fully considered in a previous article published in this Journal. The reader will observe that the methods just described of connecting together static machines for their combined action are equally useful for the charging of one machine from another. Owing to the abundance of x-rays placed at our disposal by the fortunate combination we are afforded an excellent opportunity to study the x-ray field of energy, and by exploring the same observe their rectilinear and diverging course from the target into space; take notice of their varying quantities and qualities as modified by the following conditions:

(1) Distance from point of emission. (2) Speed and number of plates of generator. (3) Presence or absence of spark gaps, various size, number, position, length and manner of construction. (4) The presence of condensors, their size, number and method of discharge. (5) Varying resistance of the Crookes tube, resulting from changes in the degree of its exhaustion. (6) More than one tube in the circuit.

All of the conditions enumerated modify the generating capacity of the x-ray bulbs, and give information requisite to determine the position of patient, sensitive photographic surface, the shape and construction of the latter, in order that the x-ray pictures of the interior of the human organism may be fully as free from distortion as the delineations of its exterior by the expert photographer.

Buffalo, N. Y.

Electrolysis.

By H. P. Fitzpatrick, M. D., Ph. R.

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There are so many reasons why an extended article on "Electrolysis" is needed at this time, when, by its prompt and proper application so many facial defects can be removed, that the writer intends to go into the subject with minuteness, (especially as to best methods of treatment), and give in detail the various defects coming daily before the average dermatologist.

By taking it for granted that every physician has some work on dermatology, we can in the commencement eliminate the etiology and diagnosis, and confine this article to modes of treatment.

This will so simplify matters as to insure the taking up of the subject of treatment in extenso and with sufficient precision to preclude the possibility of failure, when ordinary care and a little practical experience are a part of the physician's equipment.

In electrolysis we have a powerful and at the same time comparatively painless form of electric energy. As a hemostatic, as a simple irritant, as a powerful irritant, as a disintegrator of living tissue, as an anesthetic for local purposes, as an antiseptic, and finally, as a decomposer of abnormal growths, malignant or non-malignant, it is, in the writer's opinion, which is formed from extended experience, the remedy par excellence. Take for instance papillomas, moles, verrucae or warty excrescences, xanthomas, cutaneous cornus, medium-sized tumors, or any elevated abnormal tissue formation, and apply electrolysis as per instruction to follow, and you will become as enthusiastic as you are now lukewarm. There is no question but that it is the most appropriate method for their extermination.

In the treatment of enlarged capillaries, such as the enlarged superficial vessels of the nose and cheek, in all forms of acne rosacea, in nevus araneous or spider cancer, in nevus pigmentosus, and all other varieties of so-called birthmarks, there is nothing so certain as electrolysis; and if the operator uses good judgment no other method will leave the skin in such perfect condition.

If eye specialists would only take up electrolysis for the removal of ingrowing eye-lashes they would prevent untold suffering and get good fees from those unfortunately afflicted in this manner. A few drops of 4 per cent. solution of cocaine in the eye and an eye clamp to evert the lid, a fine pointed electrolysis needle, a current of from 1 to 3 milliamperes and in the worst cases not to exceed three hours will be required to restore perfect sight and bring immediate relief to many who were tortured beyond description.

Could electrolysis do no more than this it would be worthy of esteem for ridding the afflicted of these indescribable irritators. In all facial eruptions, acne, acne vulgaris, acne punctata, etc., electrolysis as the antiseptic and soothing agent and corrected diet as the adjunct will be all the treatment required. The electrolytic action being powerfully antiseptic, destroys all micro-organisms, and ungents and corrected diet do the rest.

When growths are benign the removal is a question of no moment, but when they begin to undergo changes such as the breaking down of tissue, redness, inflammation, softening, shooting pains and other evidences of the approach of malignancy, then transfixing the growth with the needle and decomposing the tissue so thoroly as to prevent the possibility of recurrence will be all the treatment necessary.

Curetting, galvano-cautery, pyrogallic acid, are all scarifying. Electrolysis is as certain; scar, nil. Then why not use the method that gives the patient the best cosmetic effect.

From personal observation in numerous instances where growths have returned after having been removed by the knife, one treatment by electrolysis was all that was necessary to destroy them. In these cases the knife leaves some portion of the structure intact to build up a new growth, while electrolysis insidiously insinuates its decomposing elements into every portion of the growth and eliminates it completely. For this work a stronger current is necessary, and it would be advisable to begin with

2 or 3 milliamperes and increase gradually to the point of tolerance. In fibrous tumors it may be necessary to use the more powerful acid current of the positive pole, and if so, use a platinum or irido-platinum needle.

Unless an elaborate outfit is desired an office can be fitted up at very small expense. The first requisite is the battery.

For permanent office use, a 30 to 40 cell McIntosh cabinet battery is the best.

By shifting the current to different cells from time to time, thus resting one set while using another, your battery is always in good condition.

A battery of 30 cells should give all the current desired by a busy dermatologist, and if used carefully should not require recharging oftener than once a year.

A small portable battery of from 6 to 12 cells will suffice, however, and perhaps be best suited for infrequent use

Any needle holder that will make a perfect connection with cord tip and needle will answer.

A pair of fine tipped epilating forceps, two sponge electrodes, two sets of cords, a galvanometer, three flexible steel needles, three platinum or irido-platinum needles, all of which can be bought at your instrument house.

Your needles should all be fine pointed. The bulbous needle will nearly always scar.

When using the positive pole for electrolytic work, use your platinum needle, as the acidity at the positive pole decomposes the steel needle and leaves a black pigmentation in the skin. This can be removed, however, by inserting the negative pole at point of pigmentation. When you do not feel any too sure of your ability to handle the battery it would be advisable to use only platinum or irido-platinum needles.

A northern exposure gives the best light for this work. Have your operating chair placed so that the patient will face the window. For the removal of superfluous hair on chin or cheeks use from 3 to 5 milliamperes. Connect the needle with the negative (zinc) pole of the battery. For the more sensitive parts, viz.: nose, nostrils, upper lip, ears and breast, from 1 to 3 milliamperes. Bear in mind, however, that no fixed amount of electricity can be used on different patients for the same defect. Idiosyncrasies, physical conditions, the texture of the skin, all must enter into your calculations as to how much or how little to use. A good rule is to begin with the minimum amount and gradually increase to the maximum or to the point of tolerance.

The best way to get an even, continuous current is to use a bowl of water and have the patient make and break the current by placing the fingers in and out as the needle is inserted and withdrawn. A sponge electrode must be frequently resaturated or the water is absorbed and the current becomes too weak to be effectual. The removal of superfluous hairs, requires delicacy of touch, considerable experience, and a natural adaptability for perfect success.

No one is entitled to recognition as an expert in the branch of dermatological work who, after subsidence of inflammation and dessication of the crust formations, leaves permanent cicatricial traces of this operation.

Place your patient in such a position that a strong light will always be on the field selected for your operation. In order to prevent the possibility of scarring the patient select the largest hairs for the first operation and keep the points of vesiculation so distantly separated as to preclude their coalescing Insert the needle along the hair shaft

until from ⅛ to ¼ of an inch has been inserted into the follicle. By frequent practice you will find that the needle seems to slip into the follicle intuitively.

After connection is made and the electrolytic action is completed withdraw the needle. Now remove the hair and follow the above procedure on each hair until operation is suspended. When traction is required to remove the hair the follicle is not decomposed and the needle must be reinserted and the electrolytic action continued until the hair drops out of the follicle without the least resistance. You will be more likely to retain your patient and secure her friends by slow but sure work than by rapid but poor work. By making up your mind to thoroness even to slowness, you will have an established principle that will remain when your experience brings rapidity and increasing dexterity. A conscientious operator who practices daily will soon become sufficiently proficient to undertake the most delicate of these operations without fear of the results. The writer has in one case destroyed 28,000 hairs without leaving the slightest trace of the operation. If there is any question in the reader's mind as to the accuracy of the count, the fact that the work was paid for by the hair, will I think, dispel it.

For moles, warts and all elevated, abnormal growths transfix the raised tissue with the needle connected as before with the negative pole, and continue inserting at different points until the growth is thoroly decomposed. Then bevel the edges of the growth until the raised tissue is decomposed level with the surrounding skin. In treating raised tissue always insert thru and not down into it. When the growth is reduced to the surface of the skin the crust formation will not scar, but if the needle is inserted into the growth the result of such treatment will be a depression or pit. From 2 to 5 milliamperes, depending upon location, will be sufficient.

It is really surprising how quickly these abhorrent conditions yield to the needle when scientifically applied.

Taking for illustration the very ordinary condition commonly known as "red nose," wherein the formerly invisible capillaries have thru exposure to weather, thru drink, or stomach disorders, become so engorged and stretched, as to attract attention and create comment; an almost miraculous improvement occurs after one treatment by electrolysis.

As the operator desires to drive the blood into the deeper vessels and set up sufficient inflammation in the superficial ones to occlude them, it is best to begin operating at the tip of the nose and carry your work forward toward the base. An exceedingly fine needle is necessary as the nose is quite sensitive. The vessel operated upon will become blanched from the point of insertion of the needle to the extreme point of electrolytic action; therefore, in following up the treatment, reinsert your needle as near the point of furthest electrolytic action as possible, and continue following the vessel in this way until it has disappeared. Unless collateral circulation is established before inflammation occludes the vessel operated upon, it will collapse and bring that portion of the nose back to its normal condition. In this operation it is best to begin with one milliampere, and gradually increase to two or three milliamperes. In operating upon nevus araneous or spider cancer, we find a large central vessel with numerous radiatory branches that spread out from the central aneurismal loop in a perfect spider web network. By inserting your needle into this central vessel and using about 4 milliamperes of electricity for

two or three minutes the central and radiating vessels become blanched and the operation is completed.

For birthmarks of the venous and arterial varieties, where the vessels are engorged and stretched to the utmost, frequent operations are required. Except in the case of large vessels, connect the needle to the negative pole.

An arterial birthmark that covered one side of the face required weekly treatments for nearly a year before the writer removed it. Yet the improvement is so pronounced after two or three treatments that your patient will continue until a cure is effected. By inserting a single long needle into several vessels at once you will get better results than in using a cluster of needles. A strong current is required for this work. Begin with 4 milliamperes and increase gradually to the point of tolerance. Persistence and perservance in this treatment will remove the worst birthmark extant.

Cutaneous cornus appear on the nose or cheek. They frequently grow from 1 to 1½ inches in length and may be ½ an inch to 1 inch in diameter at the base.

Many methods have been used with more or less success for the eradication of these growths, such for instance, as Pusey's method of removing the horny layer, curetting the base and applying pyrogallic acid upon the site of the cornus. This method leaves a white scar; whereas in recent cases by electrolysis it would be hard to find the former seat of the growth.

By inserting your needle through the base at the point of junction with the skin, and decomposing the cornu with the negative current until it can be lifted away; and then smoothing the base to a level with the skin; a new skin will form, throw off the crust, and in a few weeks look perfectly natural.

About 3 milliamperes will be current enough for the work. There are many other blemishes worthy of notice in this article, but as space is limited it would probably be better to defer taking them up now and use them for another article later. The writer does not believe he is over-enthusiastic on the subject of electrolysis. His experience justifies every statement made and his private opinion of electrolysis is much more emphatic than any written public statement.

Given the skill, the proper instructions, and the experience, and no method compares with electrolysis for such work as is outlined in this article.

Botch your work, use no discretion in the treatment of different cases, go at it in a happy-go-lucky way, and you will get the same results as that kind of surgeon or that kind of dentist gets in his work.

The whole secret of success in electrolysis work, as in all others, lies in doing well all you undertake, and in not undertaking to do a thing until you are positive you can.

Detection of Gall Stones by the X-Ray.

By Mr. W. C. Fuchs, Chicago.

The liver in its continuous movement will almost eliminate the shadows produced by gall stones. A plan was adopted to skiagraph the liver at rest.

The apparatus used is a 10-inch spark induction coil, equipped with a Wehnelt interrupter. The primary coil is wound with four separate layers of wire, the ends of each layer are connected to a switch board and so arranged that one, two, three or four coils can be connected in parallel or in series, the connections to be made suitable for the vacuum of the tube to be used.

Have the patient lie face downward, with the plate beneath. Place the tube directly over the center of the liver. Instruct the patient to keep his breath in deep inspiration while the current is sent through the tube. The patient will give the signal when to switch off the current.

These short-exposed radiographs show the gall stones clearly defined, tho the surrounding parts are not as clear as when more time is given.

I have found by using this plan that a Crookes tube of any degree of vacuum can be used at its highest efficiency when the proper connections are made in the coils composing the primary. The photographic plate was not under-exposed at a 15-seconds' exposure.

An induction coil giving a 12-inch spark can be easily calibrated for a Wehnelt interrupter. Choose a size of wire such that four layers on the primary will fill up the available space between the iron core and secondary tube.

There must be sufficient ampere turns on the first layer to give a secondary spark of four inches; 220 volt service will give best results.

Case 1. B. M., railroad man, 45 years old, native of Illinois, complained of abdominal pain, occasional febrile attacks and loss of appetite. He gave no previous history of colic, jaundice, or gall stones in the stool, and there appeared no other similar definite indications. He was emaciated. A diagnosis of cardialgia, intestinal disease and neuralgia had been made.

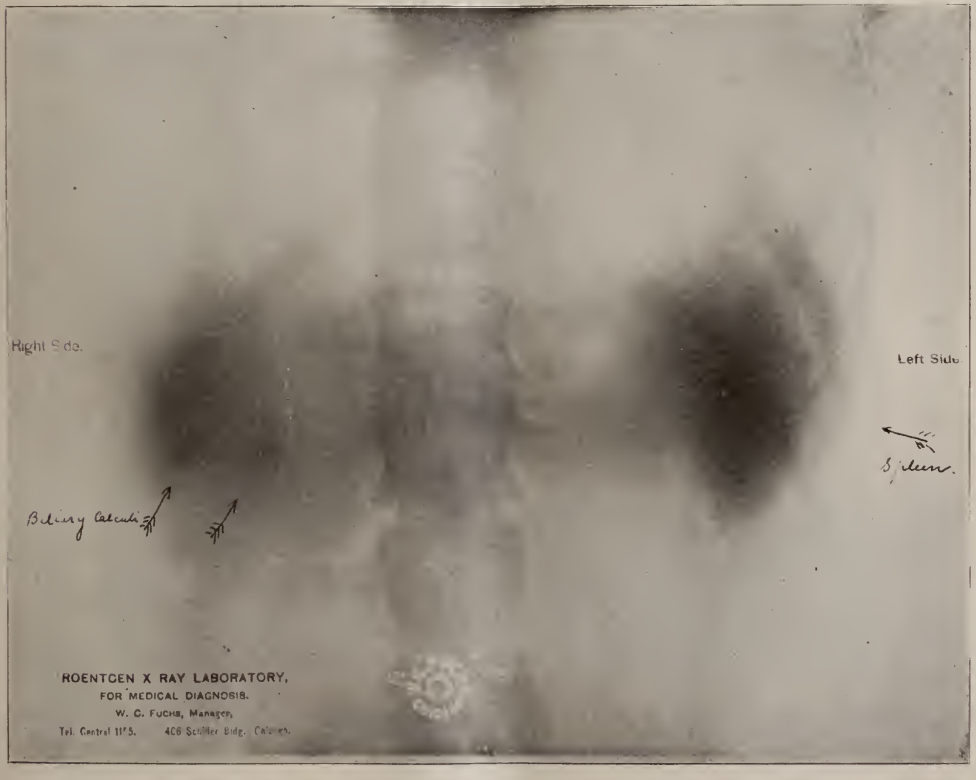


Fig. 1.

The skiagraph, (Fig. 1), shows two gall stones and an enlarged spleen. A successful operation confirmed the radiographic findings.

Case 2. J. B., female, 35 years old,

Cholesterin Stone in the Gall Bladder. Stone removed by operation.

Fig. 2.

Fig. 3.

married, born in Illinois, weighs 140 pounds; appeared for examination with a hard lump in the region of the gall bladder. The usual positive clinical symptoms of gall stone were entirely wanting. Physical examination of the liver yielded negative results, but the gall bladder seemed distended with stones. The friction of the stones upon each other could be heard with the stethoscope. An operation removed 185 stones and recovery ensued.

Case 3. A man 40 years old, who weighed 190 pounds, was without any history of jaundice or digestive disturbances. Short attacks of colic occurred at intervals for some months, followed by an intermission and a return of the paroxisms. The findings of the skiagraph were corroborated by an exploratory operation, which revealed a calculus in a fibrous capsule infiltrated with lime salts.

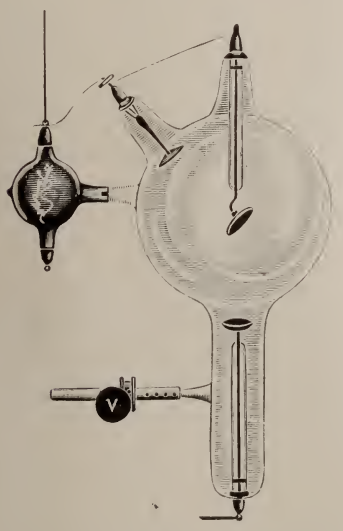
Case 4. A prominent Chicago practitioner, 60 years old, at one time had an attack of colic which the doctor thought was due to gall stones. The skiagraph shows dark shadows in the region of the gall bladder. At the autopsy, three gall stones were found in the viscus.

Fig. 4.

A New X-Ray Tube.

What promises to be one of the best x-ray tubes yet made is known as the Truax-Greene Improved German tube. In appearance this tube slightly resembles the Mueller self-regulating tube, but it is larger. The vacuum is reduced by the direct admission of air through the capillary valve V by simply turning a milled head. It is raised by means of an absorbent substance contained in the small auxiliary bulb, which is connected with the main tube, on the same principle as in a Mueller tube.

The advantages of the Truax-Greene tube are two: First, the vacuum can be raised and lowered rapidly; Secondly, this can be done while the tube is in action without changing any connections. When in use, the anodal con-



nection is made with the wire on the auxiliary bulb. To raise the vacuum, all that is required is to raise the button on the end of the spring which connects this with the main tube, thus forcing the kathode stream in part into the auxiliary bulb, in which the gaseous particles are absorbed.

Without knowing the extent of the experiments which have been performed with this tube it is impossible for us to say what the capacity of the absorbent is, but we presume that it is amply sufficient for the life of the tube.

The Chicago Electro-Medical Society.

This society was organized June 25, 1901, by Drs. A. W. Baer, G. G. Burdick, S. V. Clevenger, Emil H. Grubbe, H. Preston Pratt and Richard H. Street, for investigations in the science of electro-therapeutics. At that date, only a little over a year ago, many of the older regular medical journals refused to publish reports of cases treated by the x-rays or static electricity. Indeed, the great majority of physicians, knowing little or nothing of the subject, were convinced that electro-therapeutics and x-ray therapeutics were mere fads. Today every reputable medical journal invites papers on these subjects, and the change in professional opinion has been brot about largely thru the efforts of the Chicago Electro-Medical Society and similar bodies in other places.

A large number of valuable papers, both theoretical and practical, have been read before the society. But the most valuable feature has been the discussions to which the papers and reports gave rise. Few men do their best work when working alone. The stimulus of other minds, by rivalry, suggestion, criticism, or incredulity, is needed to bring out the best that is in them; and this Journal hopes to see in the near future similar Electro-Medical Societies in all centers large enough to contain half a dozen or more workers in this department.

The officers of the Chicago Electro-Medical Society are the following:

President, Gordon G. Burdick, M.D.

First Vice-President, A. W. Baer, M. D.

Second Vice-President, Emil H. Grubbe, B.S., M.D.

Secretary, T. Proctor Hall, Ph. D., M. D.

Treasurer, Richard H. Street, M.D.

Standing committees are appointed as follows: Membership, Auditing, Publication, Scientific Research, Executive.

Persons outside the medical profession who are interested in the work of the society may be admitted as Associates.

The regular meetings are held monthly, with a vacation during July and August. The next meeting will be held in the Masonic Temple, Tuesday evening, September 30, 1902.

The American X-Ray Journal will report the proceedings of the Chicago Electro-Medical Society, and of all similar organizations which will send us regular reports.

Local Electrotherapeutical and X-Ray Societies exist in several parts and more are being formed. Provision should be made at the next meeting of the Roentgen Ray Society of America, which will be held in Chicago, December 10th and 11th, to include these as branches of the national society. Only by such means can the best work be done and the medical fraternity reap the greatest advantage from their associations.

Resolution to Restrict the Use of X-Rays.

At a recent regular meeting the Chicago Electro-Medical Society unanimously adopted the following resolution:

"Whereas the x-ray is a therapeutic agent of recognized value, and in the hands of ignorant and unskilful persons is liable to do serious injury to anyone exposed thereto, and

"Whereas the professed object of an x-ray operator is exposing a subject to x-rays does not alter the effect of the rays or the dangers incurred, and

"Whereas physicians are the only class of persons recognized by law as having the necessary knowledge and training to justify them in the therapeutic use of dangerous agents,

"Therefore it is the opinion of this society that the Medical Practice Act of the State of Illinois should be so interpreted, or if necessary so amended, as to make it unlawful for any person not a legally qualified medical practitioner to expose to the x-rays, for any purpose whatever, any part of the living human body, for hire or expectation of reward."

The Chicago Electro-Medical Society is undoubtedly right in desiring that only those who have some knowledge of physiology and therapeutics should be permitted to use x-rays upon the human body. Medical societies, in their own interest as well as in the interest of the public, should bring this matter before the various State Legislatures for action.

It is equally important that those who undertake to give x-ray treatment should know all that can be learned about the properties of the x-rays, their use, and the precautions that are necessary to avoid bad results. Information of this kind will be found in the pages of this Journal.

X-Ray Story.

By Dr. Fred S. O'Hara.

CHAPTER III.

Upon my next visit to Dr. Barsto, I found him busily engaged in working an x-ray tube, tho there was no apparent reason why he should do so. During my

various excursions into his consultation room I had gradually acquired the privilege of using the fluoroscope, and now I thot I would take another look at my hand. Tho the color of the tube was apparently the same as I had ofttimes seen, I could not see even a ray of light from my point of observation.

"Doctor, I cannot see the rays," I volunteered. "No more has any man, since the discovery of their existence," was his reply. "The Roentgen rays are invisible, but they possess the property of exciting fluorescence in certain compounds, among these compounds being tungstate of calcium and platino-cyanid of barium. When you place your hand in front of the screen, you see only the fluorescence of the metallic compound coated upon the screen. When you think that you see the bones, it is really that portion of the screen cut off from the rays, and not excited by them. At these places the rays are absorbed by the bony structures, and you see the metallic compound in repose."

"But why cannot I see the same phenomenon, at present?"

"I am curing this tube. It is working in reversal, and by reversing the direction of the current that produces the rays, I am reducing the vacuum of the tube until it will be suitable for practical work once more. If this does not suffice, I shall lay this tube aside for a few weeks and 'rest it.' That is often of great benefit.

"A thoroly rested tube is often better than a new one, as I once had occasion to prove to my friend, Ackerman Olden. But that is another story, and before I settle myself to tell it, I wish to get this tube into condition so that I may use it tomorrow."

Whilst he was working I asked him why it was that I could see light from the tube, tho the rays were invisible.

"That is due to the collision of molecules in the tube. The Crookes tube is a highly exhausted affair, but it is impossible to exhaust all the air from it. That which is left within it is of such slight density that the molecules of oxygen, nitrogen, carbon dioxid, argon, and God only knows what else, are readily pushed and pulled about by the electromotive force. The collision of these molecules is responsible for light in the tube, known as fluorescence. By the color of the tube in action I can tell whether it is of American or foreign manufacture, for in some glass (that in which lead is used), the radiance inside the tube is blue, like the egg of a robin; and in some other varieties of glass the color varies from a light green to a canary yellow. The color is immaterial within certain limits, but a poor tube may give off the color of a good one, whilst being absolutely valueless for working. This is due to thinness of spark or to a fault in the tube itself.

"In producing proper radiance I shall tell you that there are several things to be remembered. It reminds me not a little of giving doses of medicine. We dose the tube with current, as we administer medicine, that is, with reference to certain laws laid down by experience and by experiments.

"Now we will suppose that we are going to radiograph a bullet in situ. A large dose of rays will show the most contrast, and take the shortest time; a small dosage will produce the same result, but with a much longer exposure. Rays of high penetration will produce little or no contrast between bodies of little difference in density, whilst a medium quality of rays will give the best definition and quality of negative. A tube that gives off a great quantity of radiance affects a plate more strongly than does one of fewer rays and greater

strength. But quality of rays, and not quantity, is that which is responsible for good work. However, there is nothing in the whole domain of the use of the Crookes tube (pictorially speaking) that calls for small dosage of rays.

"But I am tiring you. This is not calculated to arouse the interest of any but a physician, and as I have succeeded in getting this tube into shape, we will have a cigar, and a story, for I have an idea that such was the object of your visit."

Settling ourselves comfortably, and contentedly puffing at our perfectos, the Doctor began the tale.

During the spring of '98, I had so much night work that I had almost acquired the art of sleeping during my walks about town. One night after I had made a call as usual, 'long about midnight, I passed the show window of Gorman & Peron, jewellers, on my way to my apartments. I noticed in this window a very large diamond with a very peculiar cutting and a heavy, cumbersome setting. The placard beneath the ring interested me more than aught else for the moment; it read about like this:

'Five Thousand Years Old.'

'This ring was found in the wrappings of a royal mummy recently unearthed from a tomb near the Pyramid of Cheops. The inscription upon the mummy case, when deciphered, gave forth the fact that the eldest princess of the realm, daughter of Ptolemy I., lay therein buried. This diamond is the most marvellous illustration of the work of the ancient Egyptian lapidaries now extant, and is valued at $125,000. It will be upon exhibition for this week only.'

I surveyed the gem more closely on account of this intelligence. What a history was therein concealed! What a tale of the Dynasty of the Ptolemies could it tell if given a tongue wherewith to speak! But that was not getting to bed, so I hastened on.

The more I thought of the gem the greater was my astonishment that it should be left in the window at that hour of the night, for my watch registered the wee small hour of 1 o'clock. I knew that no jeweler would leave such a thing in the window overnight, but by this time a predominant desire to investigate the merits of rest engrossed me, despite the carelessness of jewellers.

The next morning at the breakfast table I opened the morning paper and was astonished to read that the very treasure that I had contemplated last night was stolen. 'Thieves carry away the priceless relic of ancient times. Window cut with a diamond drill and gem extracted through the opening.' Then came an elaboration upon the relic and a vast discourse upon its value, warped and distorted as only reporters can twist things, and finally the statement that by some strange oversight the ring had been left in the window overnight.

I threw aside the paper with the remark, 'There is another nut for Olden to crack, and I was startled by that gentleman himself laying a heavy tho friendly hand upon my shoulder.

'Cut out that breakfast and hustle to your office as fast as a cab can carry you? I will explain later.'

I obeyed the mandate with celerity, and five minutes later was sitting in my office waiting I knew not what. In a very few minutes a well dressed gentleman in evident perturbation stepped into my reception room. I invited him into the private office and he introduced himself as J. Z. Gorman, of Gorman & Peron, jewelers.

Said he: 'I was about to take the train for New York City, to report in person the theft of last night, but at my

breakfast I was seized with a sudden distress and nausea, and I have come here for relief. I assure you it is of the utmost importance that I make the train which leaves in a half hour, so try and straighten me out in time to catch it, for I have to make good the loss they have sustained.' He had grown pale and drops of clammy sweat stood upon his brow.

I placed a large porcelain dressing jar beside him, and soon I had occasion to thank myself for my forethot. My patient's attack of emesis was bidding fair to turn him wrong side out.

I prepared a gastric sedative for him and it was vehemently rejected by the stomach ere it was well settled. I quizzed him at length upon the constituency of his breakfast, and could find nothing that would cause such an irritation of the gastric membranes.

A light rap upon the door called my attention, and I opened it to admit Ackerman Olden.

Ignoring me he said: 'Mr. Gorman, I saw that you were ill at breakfast, and I took the liberty of following you here to see if I could be of assistance to you in a legal way. Such sudden distress is frequently the result of poison.'

'Do not apologize, Mr. Olden. I am glad to see you. Have you learned anything of the case of last night?'

'Not a thing, but it is a little soon for developments. But, say, Doctor, you have been boasting of that wonderful machine of yours, why don't you try with it and see if you can tell what is irritating Mr. Gorman's stomach?'

Ackerman took the key to the case doors. He selected a new tube, and before I was well aware of what was happening, had connected the apparatus, and was surveying the interior of Mr. Gorman. I saw a puzzled look come over Olden's face, and without further ado he handed me the fluoroscope. I simply placed it upon the table, disconnected the tube (after short circuiting the machine by means of a chain and lath, selected a cured tube that had rested for a couple of weeks, connected it up, and removed the lath. The beautiful glow showed me that everything was O. K. and I then handed the fluoroscope to Olden.

A hasty survey sufficed him. A light was breaking upon my brain. I was beginning to see the trend of affairs. I was about to take a look through the mechanism of Mr. Gorman, when Olden waved me aside and said, 'Mr. Gorman, pardon my insolence, but will you allow me to place my hand in your inside vest pocket. But before I take that liberty, I take pleasure in informing you that the Egyptian diamond is located, and will soon be in my hand.' A hasty scuffle, in which Olden's hand sought out the pocket in question, and Gorman sank completely crushed into a chair.

'I'll keep this little package for you, Mr. Gorman,' said Olden; 'you might lose it. The substitute stone that I found this morning was good enough for a beginner to work upon, but you ought not to try to play tricks upon an old jeweler like myself. Come along. I have a cab down stairs,' and Gorman meekly followed Detective Olden from the office. As Olden left the room, he muttered the single word, 'apomorphia.'

There were some few features of this drama from life that were past my comprehension. One of the best known business men of the city, arrested and confessing to a theft! But why the apomorphine? I knew that Olden would explain the matter to me; so I went to the club and finished my morning meal.

That night Mr. Olden honored me with a visit. His opening remark was sufficient to make me joyous. 'Congra-

tulate me, Doctor; I am now Inspector of my district, and I shall smoke better cigars and drink better mineral water in the future.'

I congratulated him with the ardor of long standing friendship.

"But how did you know that Gorman had the diamond?"

"I thought you would be astonished," he replied. "I guess I had better tell you all about it."

I produced a box of perfectos and a cold bottle of mineral water (or something else), and after helping himself to both these delicacies Mr. Olden seated himself in my examining chair, tilted himself away back and began his story.

"I was on the scene bright and early' for the chief had sent for me so soon as the theft was discovered. I went through the safe in order to see that the ring had not been misplaced. Then I went to Gorman's apartments, and his actions showed me that there was big game in the air. One question asked by him put me on to the whole business. 'Did you look down the grating under the window,' said he, and I acknowledged my negligence in that respect. I hustled to the store and after a short search underneath the grating, I found a ring so like the original that had I not known something of diamonds and their cutting, I would have been deceived. There is only one man in this part of the country that could make such an imitation and that is Gorman himself. I remembered having seen him at work a few nights before in the manufacturing department of his store, and I supposed it was some particular job, but it seems that at that time I did not recognize the full importance of it.

He had calculated well. The finding of the substitute stone would hold interest until he could get away and store the real ring in New York, but the dose of apomorphia that I slipped into his coffee before I left him, cut that short.

"But would not the other jewelers in the city detect the change?" I queried.

"How would they get to see it when it was locked up in the safe at the police station awaiting identification from New York? Of course the game would be up when an expert that had seen the jewel before made an examination. But the suspicion of change would have fallen upon a clerk, and not upon the real culprit. You see that it was necessary for me to catch him red-handed, and by means of the x-ray I was successful, for I saw the ring in his pocket (not the diamond), and the rest you know. The inside vest pocket is the most natural place in the world to secret valuables, because it is the hardest of access; and when I saw the outline of metal, shaped like the Ptolemy stone setting, and upon the right hand side of the suspect, I made bold to ask him to shell out."

And so ended the story of the theft of the Egyptian diamond. Gorman was duly punished and Olden became next in line for promotion.

I feel sure that I was never so at sea regarding a case, and in this particular instance he gave me good measure in return for the advice I had lent him from time to time.

Dr. Barsto smiled and relighted his cigar. Our conference was at an end. I bade him good night, and with a hearty handshake he bade me come again and I passed from his office into the night.

There has been a large number of negative results in the attempts made to destroy bacteria in cultures by x-rays. This was to be expected. Under the circumstances, so little being known about x-rays, one set of carefully conducted experiments with positive results is enough to outweigh a hundred with negative results.

EDITORIAL.

St. Louis, Mo., 8-9-'02.

To the Managing Editor, American X-Ray Journal.

My Dear Doctor:—

On assuming control of the American X-Ray Journal, as owner of the property and managing editor, I desire to congratulate you upon the wholesome and enviable position you occupy before the scientific and professional world. Priority in anything useful to the human race calls forth from mankind the kindest remembrances. But when the fruit of investigation, as in your case, has presented a means for the relief of inoperable and so called incurable diseases, the gratitude of an appreciative people is without measure. He who gives better means for transportation, better clothing, or better food, is in no wise equal as a donor to him who can give health where there was hopeless sorrow.

It is now a matter of history that you were the first to use the x-ray in treating disease. I have the record of your work in treating cancer by x-rays, early in April 1896, and also of your treatment of phthisical patients in the same month. I recall with especial pride your experiments for the purpose of determining the bactericidal effect of the x-rays, begun as early as April 5th, 1896, just four months after the discovery by Professor Roentgen. Certainly no one can claim priority over you, for this work is recorded in the public and medical press of that date. I am glad to note also that the Research Committee of the Chicago Electro-Medical Society in its regular meeting March 25, 1902, recognized your title to this same distinction.

These are some of the reasons which I feel sure place you in a position to take up the work of conducting this publication in accordance with the wishes of the profession. Your unremitting labors will now have opportunity to be better appreciated.

Yours truly,
HEBER ROBARTS, M. D.

Priority in X-Ray Journalism.

In February, 1896, Dr. Heber Robarts of St. Louis, Mo., gave an order to an electrical manufacturing concern in Boston, Mass., to construct for him a x-ray machine from the high frequency type of the Tesla coil. This order was made two months after Professor Roentgen's discovery. The machine was completed and delivered to Dr. Robarts in May. It was the first efficient apparatus made to do practical x-ray work and used west of the Mississippi. The excellent diagnostic work done with this machine, together with a suggestion that the rays had therapeutic properties, encouraged the doctor to obtain the fullest possible information. From medical journals and the public press it was quite difficult to obtain

exact data, and a system of correspondence was likewise unsatisfactory. He therefore decided to establish a journal devoted to the cause, and to invite the enthusiast and all persons interested in the x-ray to give their experience. In April 1897 the matter was prepared for the first issue of the AMERICAN X-RAY JOURNAL.

Its field of usefullness did not seem apparent to many of those that choose to guide the bark of professional hopes, but it had been launched and adverse criticism did not sink it.

The AMERICAN X-RAY JOURNAL is the parent x-ray journal in the world. Every other publication devoted exclusively or partially to the x-ray is an imitation, whether it be monthly, bi-monthly or quarterly. The matter contained in this Journal is a truthful record of the researches throughout the world regarding Roentgen's discovery. Every book published on the x-rays, and worthy of mention, has taken much of its matter from the pages of the AMERICAN X-RAY JOURNAL. This is well seen in two valuable books just from the press, one by Dr. David Walsh of London, Eng., entitled "Roentgen Rays in Medical Work;" the other by Dr. S. H. Monell of New York, entitled "A Pictorial System of Instruction".

At times the AMERICAN X-RAY JOURNAL has been most vigorous in denouncing false doctrine. One instance we will cite is that of the "Inaccuracies of the x-rays," so called by men influential in medical circles. These same persons, without any technical knowledge of x-ray uses affected great learning and wrote misleading articles, mere rot, that had to be put down at once to save this science for the practitioner. Another instance was seen in the effort made to treat the great discovery as a joke. A professor of surgery and dean of a medical college, we are told, in a lecture likened the x-ray to the kodak. Efforts were made to shelve it by according it a place with the electrical faker. The AMERICAN X-RAY JOURNAL promptly drove these fallacies into oblivion. The light that followed this courageous course has made America foremost in the successful use of the rays.

The truth having been established that an x-ray apparatus is the most important implement of the doctor's armamentarium, that the AMERICAN X-RAY JOURNAL is living history and must be in the hands of every up-to-date doctor, that the therapy of the x-ray as predicted in 1896 has been fully realized, and in fact all the prophecies made by Dr. Roborts in the Announcement of the first Journal have been fulfilled; he has willingly accepted a well earned rest.

We quote from Dr. Robarts' Announcement written in April 1897. "The conduct of this journal will not be arrogant, defiant or bigoted, but it will will have the courage of con-

viction to push forward the truth as we understand the truth. It will be ethical, as the throbbings of every breast should be, regardless of any written code devised by man for another's guide. There will be no personal venom, as we hold no animus against any man, but false principals will be attacked with the vigor of our ability. This is a pioneer journal of x-ray work. We are not imitators. We are casting our hopes among the needs and wants of man. We expect encouragement.

"While it can not be expected nor desired that we shall escape just criticism, and it may be constumely, yet our aim shall be to improve each coming journal, encouraged as we are with the faith and usefulness of our mission."

In common with a very large number of x-ray workers we desire to express our high appreciation of Dr. Robarts' pioneer work. The medical profession owes him a deep debt of gratitude for his unselfishness and unswerving honesty of purpose, which, as Dr. Pitkin aptly says, "Have been so largely instrumental in making this light shine forth in all its glory for the healing of the nations."

The new management is heir to a journal of stainless reputation and genuine worth. Its aim will be by adherence to the highest ideals and by legitimate business energy to make the AMERICAN X-RAY JOURNAL the best of its kind in the world. T. PROCTOR HALL,
EDITOR.

Destruction of Bacteria by X-Rays.

H. Rieder reports in Muenchener Medicinische Wochenschrift, March, 1902, a continuation of experiments begun by him in 1898 relative to this subject. The bactericidal power of the Roentgen rays was tested against the cholera spirillum, the bacillus prodigiosus and the colon bacillus. The micro-organisms were inoculated into gelatine or agar and exposed to the action of the rays in Petri dishes, the covers being removed. After twenty to thirty minutes' continuous exposure to the rays many of the bacteria were killed, and multiplication ceased in nearly all. In every series of experiments, however, a few of the individual bacteria were not affected. Experiments have shown that the bactericidal power of the rays is not due to the fluorescent light, heat, ozone or electricity. So far as is known the culture medium is not altered by the rays or made unsuitable for the growth of bacteria. Gelatine is never liquefied. It is not, however, to be assumed on the basis of the above experiments that the Reontgen rays possess any bactericidal action upon bacteria when present in the animal body. The evidence from animal experimentation is against such a supposition. As a rule, animals inoculated with pathogenic bacteria and exposed to the rays die sooner than similarly inoculated animals which are not thus exposed. It is not to be denied that in the human subject certain infectious diseases, particularly those of the skin, may be successfully treated by the Reontgen rays, but it does not seem probable, at the present time, that such success is due to bactericidal action.—Medical Record.

Editorial Notes.

Thirty years ago we spelled labor "labour" as our English friends do still; wagon we wrote "waggon," gulf "gulph," etc. Five years ago we wrote "iodine, morphine, sulphur," etc., for iodin, morphin, sulfur.

It is very annoying to have to learn to spell all over again, but we are obliged to follow the standard authorities in matters of this kind; and where the changes are clearly an improvement we follow willingly. When the American Philological Association advises us to drop the ugh from "though" we say "Ugh! Why, certainly," and adopt some other similar simplifications. Life is too short for such spellings as "though," "through" and "thought." Before many years we will all be sufficiently "progressiv" to write "ar," "giv," "hav," etc., and then wonder why we followed the old plan so long.

Electricity is not a cure-all. It is a form of energy which can be advantageously used to cure disease, differing not at all in this respect from heat, light and other physical agents.

In treating a patient with x-rays it is important to use a tube of such degree of vacuum that the rays reach into, and just thru, the part of the body to be treated. It is the rays that stop in the tissues that do therapeutic work. Rays that do not get there, and rays that go clear thru, do nothing.

Dr. A. D. Rockwell, author of a well known work on electrotherapeutics, says in the Medical Critic for June: "I am quite free to admit that psychical influences play an important part in electrotherapeutics, as it does in all forms of treatment. It may be even true, as Moebius states, that four-fifths of all cures ascribed to electricity are due to psychical rather than to physical influences, and, admitting that even nine-tenths of the cures are psychical—this fact would be no bar to its use nor militate against its actual value."

The doctor overlooks the fact that psychic effects are brought about thru physical agents. The psychic effects of electricity are just as definite, and just as valuable, as the chemical or physical effects. This Journal will publish a paper on the psychic effects of electricity in a later number.

In the same number of the Critic, discussing the Electrolytic Treatment of Subcutaneous Nevi, Dr. Rockwell says: "There is so much that is capricious and uncertain in electrical treatment, both medical and surgical, that it is a satisfaction to be able to turn to morbid conditions where the action of electricity is governed by unalterable fixed laws, and where its effects are specific and certain."

The Editor has often wondered why none of the text-books on electrotherapeutics give a clear statement of the principles of the science. The answer in this case is evident from our quotation. Dr. Rockwell has done excellent work in the early days of electrotherapy, and is justly honored for the work he has done. But apparently he is now resting on his oars, leaving the work to younger men who are equipped with all that modern physical and biological science can offer them, and to whom an apparent capriciousness is only a stimulus to further investigation.

The science of electrotherapeutics is not in the nebulous condition that Dr. Rockwell's remarks seem to imply.

As regards the destruction of bacilli in the body, the microscopic investigation has shown (1) the presence of tubercular bacilli in the skin in a case of lupus, and (2) the absence of the bacilli in the same region after a series of x-ray exposures. The x-rays are therefore, directly or indirectly, destructive to bacteria within the living tissues.

A case of melano-sarcoma of the lymph glands, treated by x-rays, was reported by Dr. A. E. Sterne at the Marion County Medical Society, Indiana, last April. Under treatment the masses diminished greatly, and some disappeared. But the patient grew worse, and seemed to be overcome by toxemia.

Without expressing any opinion as to this particular case, it is a fact that in the treatment of malignant or extensively diseased areas by x-rays particular attention must be paid to avenues of elimenation, in order to rid the system of poisons which are thrown into the general circulation by the action of the rays.

The Eclectic Medical Journal is publishing a series of papers by Dr. J. R. Spencer, of Cleveland, O., on Electro-Therapeutics. In the July number he deals with electro-physiology, as taught in the well known texts on that subject.

Dr. E. T. Reed writes in the Medical Brief for March an explanation of the law of sex production, as follows: "We have produced by the action of the sun and moon upon the earth, world-wide semi-diurnal electric currents; six hours positive and six hours negative, corresponding to the flow and ebb of the tides on the oceans, which may better be termed action and reaction—the great heartbeat of the universe. Salt water being strongly magnetic, we have a visible demonstration of this law on the great seas, but the effect of the law is everywhere present, and is manifest in all organic and inorganic life.

"Now, conception taking place in the positive hours, will be positive in its nature, and as a rule a male, but occurring in the negative hours, will be negative, and as a rule a female."

Only a wider knowledge of electricity among physicians, and especially a little more discrimination on the part of the editors of medical journals, will prevent the publication of such nonsense as the above. Earth-currents are not "six hours positive and six hours negative." Salt water is not "strongly magnetic." And even if both these statements had been true they would not explain sex-production.

Kienbock, of Vienna, cautions physicians that severe burns and ulcers are caused alone by over-exposure, and that the operator can no longer shield himself behind a supposed idiosyncrasy of the patient. This potent agent should only be used by those who have become thoroly expert with it, especially by studying its underlying principles and by experimenting on animals. The effects are in direct proportion to the strength or activity of the rays, and these qualities depend on various factors which must be fully understood by the operator.

The x-ray is evidently a giant in chains; he must be careful who unchains it.—The Philadelphia Medical Journal.

Hildebrand has for four years employed the Rontgen rays in various forms of internal disease for the purpose of forming some estimate of their value. He believes that they are practically useless in the recognition of the

early forms of tuberculosis, partly because these forms do not give a sufficiently distinct shadow; partly because they occur at the apex where the osseous structures are concentrated, and interfere with an accurate valuation of the pulmonary condition. In advanced cases, however, it is sometimes possible to recognize that the disease is more extensive than the physical signs apparently indicate. In cases of pulmonary gangrene, however, they are of the greatest value, and he reports three cases, in two of which Roentgen rays indicated the site of operation, and both of which recovered, and in the third the examination showed multiple foci, and an operation was therefore not performed. He also mentions a case in which pneumothorax was correctly recognized and appeared to be recurrent and without any satisfactory cause.—Muenchener Medinische Wochenschrift.

Loss of Life in the United States by Lightning.

Mr. Alfred J. Henry, Professor of Meteorology of the Weather Bureau, United States Department of Agriculture, has published a bulletin relating to the above subject.

The number of persons killed by lightning during 1900 was 713; of this number 291 persons were killed in the open, 158 in houses, 57 under trees, and 56 in barns. The circumstances attending the death of the remaining 151 are not known. Nine hundred and seventy-three persons were more or less injured by lightning during the year.

The following rules are laid down with regard to an individual struck by lightning: (1) Make the subject breathe by artificially imitating the respiratory movements of the chest; (2) Keep the body warm; (3) Send for a physician; and, in conclusion, it is noted that lightning frequently causes a temporary paralysis of the respiration and heart-beat, which, if left alone, will deepen into death, but if intelligently treated, will generally result in recovery.—Medical Record.

Glass versus Mica Plates.

In the June number of this Journal Dr. Henry S. Waite challenged the makers of mica plate static machines to a test of their merits. R. V. Wagner & Co., in our July issue, accepted the challenge on conditions which seem to be fair from a manufacturer's point of view. This is a question of more than personal interest. Everyone who uses or expects to use a static machine is interested in the result of the trial. We hope that nothing will interfere to prevent satisfactory arrangements for the contest, and that the gentlemen chosen as judges will be men who are well known for their knowledge of electricity and their experience in static and x-ray work.

We suggest that in addition to the machines selected for trial; namely, the worst that can be found by the opponent in each case under R. V. Wagner & Co.'s conditions; each contestant be asked to furnish the best machine he is able to produce. This would greatly increase the scientific value of the trial, and would make it also more equitable from every point of view.

It would be advisable also to make the contest semi-public; admitting, under reasonable limitations, any who are sufficiently interested to desire to see the tests made. The coming meeting of the Roentgen Ray Society in December would be a suitable occasion.

Carcinoma and the Rontgen rays.

G. B. Ferguson in the British Medical Journal, February 1, 1902, reports a case of recurrent carcinoma occurring on the sternum of a woman. It was the size of a hen's egg, and three surgeons had deemed operation inadvisable. The Roentgen rays were tried as a last resort. The exposure was for 20 minutes for as many days. The patient left for a month, and when she returned the tumor had disappeared. He believes there is a great future for this method of treating carcinoma.—American Medicine.

The Nashville Journal of Medicine and Surgery, reporting a paper by Dr. J. Elwood Stubbert, of Liberty, says: The fluoroscope and the Roentgen rays enables one to ascertain with a considerable degree of accuracy the position and relation of the areas of consolidation of lung tissue. In about 50 per cent of the cases the right apex is not quite so clear as the left. A slight shadow is cast by the deltoid muscle. Where there is only a very slight infiltration, the Roentgen rays reveal a haziness around the clavicle or at its edges.

The conclusions arrived at by Alfred Cooper, F.R.C.S., and expressed in The Lancet, October 12th, with regard to the remedies recommended in the treatment of inoperable cancer are in part as follows:

That in cases of inoperable rodent ulcer, and in the superficial malignant ulceration in other parts, the Roentgen rays give a good hope of improvement. —St. Louis Medical Review.

The Brooklyn Medical Journal for February published a paper by Dr. John A. Lee, entitled "The Therapeutics of the X-Rays," in which he refers to some cases of lupus and other skin diseases treated by x-rays. One case which was treated and cured in 1899, recurred in 1900; when it was again cured after only six exposures, and has remained well ever since. He emphasizes his statement that "it is unnecessary to cause dermatitis," in treating lupus. He erroneously credits the first x-ray treatment of lupus to Schiff, and the first in the United States to Jones, of San Francisco. The first case of lupus in the world to be treated by x-rays was treated by Dr. H. P. Pratt, of Chicago, in June, 1896, referred to him for treatment by Dr. John B. Murphy.

C. Beck distinguishes three different degrees of burns from the x-ray: The first degree being characterized by the symptoms of hyperemia, the cutis being infiltrated and the temperature somewhat higher. In the second degree there is the formation of blisters, the clear yellowish contents of which lift the corneous from the mucous stratum of the rete Malpighii. The third and gravest degree is characterized by the escharotic destruction of the irradiated tissues. The most characteristic difference between ordinary burns and the integumental changes produced by the Roentgen light is the fact that the latter do not manifest themselves before the lapse of a period of incubation, as a rule, about two weeks. At first there is a light, later dark, redness, and, finally, the skin becomes brown and scaled. After a few weeks there is complete recovery. Sometimes slight pigmentation of the integumen remains. In one of the author's cases of lupus treated in this way it was necessary to irradiate fifteen times before reaction occurred. It was not until the twentieth exposure that the redness decreased and some of the nodules began to shrink. After the

twenty-fifth exposure the ulcerations had disappeared and no nodules were found. The redness still persisted for six weeks.—The New York Medical Journal.

William J. Morton concludes an article on radiotherapy for cancer and other diseases as follows: (1) Radiotherapy broadens our conception of the possibilities of the therapeutics of modern medical science. (2) The x-ray has a general application for the relief of pain. (3) As to technique, a standardization as to the apparatus and its capacity, as to duration and frequency of treatments and distance of the tube, is recommended to operators. (4) The x-ray has a curative effect in internal cancer and other internal diseases. (5) For superficial disease a medium soft tube may be used, for internal cases a hard tube. The hard tube is applicable, however, in all cases. (6) X-radiation is recommended prior to any operation, to clear the tissue of cancer particles and foci, and to circumscribe the disease. (7) X-radiation is recommended after operation to preclude a recurrence. (8) X-radiation may be recommended in place of an operation, and may be preferable to one for the reason that operation secures but a comparatively moderate percentage of permanent recoveries, and because up-to-date x-ray procedure shows a continued improvement in cases, and a percentage of cures which will, undoubtedly, compare favorably with surgical operation. (9) There is danger to the patient or uncertainty as to what might be accomplished when the x-ray is employed by immature operators. (10) In x-radiation we possess more nearly a solution of the problem of curing cancer than by any other method of treatment. —Medical Record

A new Esophagoscope, for inspecting the stomach and esophagus, was described by Dr. Max Einhorn in the Medical Record for January. It consists of a straight tube with a small "cold electric lamp" at the lower end, and an obturator which is removed as soon as the tube is in position.

CLINICAL.

CARACAS, VENEZUELA, S. A.,
June the 30th, 1902.

To the Editor, American X-Ray Journal,

A patient, a lady 48 years of age, was almost dying when a *New York Herald* came into my hands, in which was an article on the marvelous effects produced by the x-rays in carcinomas. As the case was diagnosed by some physicians as carcinoma of the anterior wall of the stomach, an application was made to that region, using a pear-shaped tube of old construction, which was all we could get here, exited by an Edison 6-inch spark coil, with Laumer interrupter.

The effect of the rays was simply marvelous. The vomiting, pain and tumor disappeared after eight applications.

It is impossible to find a more severe case than the one I speak of. The patient vomited everything including water, even by drops, in spite of chloroform water, cocain, menthol, condurango bark, ice locally and internally applied, etc., etc.

Now the question arises, was it a case of carcinoma? I believe not. The previous history of long standing diarrhoea and slight fever, the progressive emaciation, speaks in favor of infllammation of the peritoneum, localized over said region, probably of tubercular nature, so much so, that the patient, although free from tumor of the epigastric region, and having improved a great deal, still continues with diarrhoea and slight fever.

The applications numbered 22 in all, and were made six months ago.

The tumor extended over the region of the epigastrum, reaching the region of the liver; was hard and painful, and pulsated with every beat of the aorta.

The skin of the epigastric region became dark with the application of the rays, but no burns of any kind occurred; they lasted

ten minutes at a time, and the tube was not placed over two inches from the surface; it was a very soft tube.

DR. BELLOSQUERAS,
(University of Pennsylvania, 1878.)

Roentgen Ray Society of America.

The next meeting of the Roentgen Ray Society of America will be held in Chicago, December 10th and 11th, and promises to be the best meeting in the history of the Society. A very fine program, which will be announced later, has been secured, and on it are several of the leading men of Medicine and Science. We will have a manufacturers' exhibit, showing the latest improvements and most approved forms of apparatus. The local preparations are in the hands of a most excellent Committee, as follows:

DR. RALPH R. CAMPBELL, *Chairman.*
414 Marquette Bldg., Chicago.

DR. JOHN B. MURPHY,
Reliance Bldg., Chicago.

DR. LOUIS E. SCHMIDT,
424 North State Street Chicago.

DR. M. L. HARRIS,
100 State Street, Chicago.

DR. W. L. BAUM,
103 State Street, Chicago.

DR. H. G. ANTHONY,
465 Dearborn Ave., Chicago.

DR. W. A. PUSEY,
Columbus Memorial Bldg., Chicago.

For any particulars or information, write to either the Executive Committee or the Committee on Arrangements.

WESTON A. PRICE, D. D. S.
Chr. Ex. Com.

The Chairman of the Local Committee informs us that the meeting will be held at the Sherman House.

Dr. James P. Marsh, member of the Executive Committee, writes that the program will be beyond criticism. Only papers of the highest grade will be accepted, and the meetings will undoubtedly be of very great interest from both scientific and practical standpoints.

The American Electro-Therapeutic Association.

The Twelth Annual Meeting of the American Electro-Therepeutical Association will be held September 2d, 3d and 4th, 1902, at Hotel Kaaterskill, Catskill Mountains, N. Y. Following is the preliminary program:

9 o'clock p. m. at the Kaaterskill Hotel, Executive Council Meeting.

September 2d, Tuesday, 1st day.

8 o'clock a. m.—Breakfast.
9 " " —Executive Meeting.
10 " " —Scientific Sessions.
1 " p. m.—Dinner.
2 " " —Excursion per Mountain Wagons.
4 " " —Afternoon Session.
9.30 " " —Parlor Entertainment and Concert.

September 3d, Wednesday, 2d day.

8 o'clock a. m.—Breakfast.
9 " " —Morning Session.
1 " p. m.—Dinner.
2 " " —Afternoon Session.
7 " " —Banquet.
9 " " —Hop.

September 4th, Thursday, 3d day.

8 o'clock a. m.—Breakfast.
9 " " —Morning Session.
1 o'clock p. m.—Dinner.

Special hotel and railway rates are arranged. For particulars write to the Chairman of the Executive Council, Dr. Robert Newman, 101 West 80th Street, New York.

Every physician who is interested in electro-therapy, will find it greatly to his advantage to be present.

Improve Your Wehnelt.

My old Wehnelt gave me very much trouble on account of the sediment being stirred up during use.

Each time I used the Wehnelt a fine sediment clouded the solution which would settle at the bottom of the jar. Next time the interrupter was used, this sediment become stirred up, and finally became sufficient in quantity to interfere with the action of the interrupter, and the solution had to be filtered.

I became tired of filtering and purchased a specimen jar eighteen inches high and seven inches in diameter. The sediment settles so far from the electrodes in this jar that it is not disturbed during use, so I always have a clear solution without filtering.

J. P. HETHERINGTON, M. D.
417 Fourth Street,
Logansport, Indiana.

Special Notice.

We are in receipt of numerous enquiries asking us to recommend physicians in various parts who are competent to use electricity and the x-ray.

We propose to reserve space in our advertising pages for cards of those we know to be competent. For conditions and terms address the publishers.

Queries Answered.

VALDOSTA, GA., JULY 25th, 1902.

MR. EDITOR:—

When I use the x-ray tube I begin thus: First, see if my machine is charged, if so, I then push the prime conductors close together, make them touch, then connect tube to machine and start machine to moving very fast; about the time I get it to moving 250 or 300 revolutions per minute, I begin to pull the sliding rods or prime conductors slowly apart until the tube lights up, then let the sliding rods remain there; as a rule the tube lights up by the time the rods are two or three inches apart. I let the rods remain in that position and run my machine with tube lighted up, sometimes one-half or three-fourths hour at a time.

Is the above description the correct way to light up a tube?

I have three cases of cancer that I am going to begin treatment on in about two weeks; I have a Truax German tube and another tube I bought from Truax. Is either one of them suitable for such work, if not, advise me what to buy.

Yours truly,
M. Y. ALLEN.

You run the risk of having your machine change its polarity as you are drawing out the sliding rods. It is safer to pull the rods wide apart after determining the polarity, stop the machine, connect your tube, and then start the machine. It is not necessary to run the machine so fast.

Any tube that gives a good supply of x-rays will do to treat cancer if your vacuum is right. Keep the vacuum so high that the rays pass through the cancer, but no higher. Six to twelve inches is the usual distance of the tube from the body.

THE AMERICAN X-RAY JOURNAL

PUBLISHED MONTHLY BY THE AMERICAN X-RAY PUBLISHING COMPANY

Editor, T. PROCTOR HALL, Ph. D., M. D.

Managing Editor, H. PRESTON PRATT, M. D.

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PROF. DANIEL R. BROWER, M. D.

PRESIDENT OF

THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.

THE AMERICAN
X-RAY JOURNAL.

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

VOL. XI. *St. Louis and Chicago, September, 1902.* *No. 3.*

Publishers' Announcement.

The American X-Ray Journal will devote its columns to the education of the medical profession in X-Ray and Electro-Therapeutical Practice.

This includes (a) X-Ray Diagnosis, both medical and surgical, the methods of fluoroscopic and photographic examination, of locating fractures and dislocations, renal and hepatic calculi, aneurisms, abnormal conditions of the heart, tumors, tubercular diseases, malformations, etc.

(b) X-Ray Therapy, treatment of cancer, tuberculosis, diseases of the skin, etc., etc.

(c) Electro-therapy of acute and chronic diseases as follows: Mental and nervous; diseases of the heart, lungs, eye, ear, nose and throat; gynecology, obstetrics, genito-urinary diseases, diseases of children; skin, liver, kidney, rectal and intestinal disorders; by such methods and apparatus as should be at the command of every practicing physician and surgeon.

(d) Dental diagnosis and treatment.

X-Ray and Electro-Physics, insofar as they directly concern the physician and surgeon; new forms of apparatus and investigations into the nature of the forces used; will receive their full share of attention.

As far as practicable, each number of the Journal will contain articles in each of the following departments:

1. Scientific and original articles for advanced workers.

2. Clinical reports of x-ray therapy and electro-therapy. Every physician, no matter what school he belongs to, is invited to send for publication reports of his cases treated with the x-ray or electricity, not exceeding two hundred words. State exactly what you did, how you did it, and the results, and the Journal will be glad to give you the space.

3. Editorial News and Notes, giving the latest news in x-ray and electro-therapeutics from all parts of the world. Translations from foreign journals will be made by the members of our own editorial staff.

4. Queries answered by well-known specialists.

5. X-Ray and Electro-Therapeutical Practice; papers by the leading specialists both here and abroad.

6. Lessons for Beginners, a complete course, consisting of 24 lessons, under the auspices of The Chicago College of X-Ray and Electro-Therapeutics, on the principles and practice of x-ray and electro-therapeutics. No physician can afford to miss this course. It is worth $100 to any practitioner.

We will expose fraud and charlatanism wherever we find it, and will exercise the utmost care to see that everything that enters the pages of the Journal is thoroly reliable. Truth is what we seek and truth we welcome from every source, giving credit where credit is due, without fear or favor.

The Journal will be enlarged as rapidly as necessary to meet all requirements. The subscription price will remain the same as heretofore: $3.00 per year in the United States, Canada and Mexico; $4.00 in foreign countries. Single copies 50 cents.

Special Notice.

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ON THE THERAPEUTICS EFFECTS OF LIGHT AND THE X-RAYS.

By J. Hall-Edwards, L. R. C. P., Surgeon Radiographer to the General and Royal Orthopedic Hospitals, Birmingham; and (late) to the Imperial Yoemanry Hospitals, South Africa.

It is only within the last few years that the therapeutic effects of light have received any serious attention at the hands of surgeons. Quite recently the Röntgen rays have been discovered, and there can be but little doubt that the extraordinary properties of these have to a great extent instigated investigators to increase their efforts in the direction of the application of light for therapeutic purposes. It is my intention in this short paper to lay before you a brief account of these researches up to date, and I shall hope to prove that altho our knowledge of the subject is extremely limited we have at hand an undeniable amount of evidence of the value of various rays in therapeutics. During the last half century much has been written on the therapeutic and pathological effects of light upon the tissues; but it was not until Dr. Niesl Finsen, of Copenhagen, took the subject in hand that any real progress was made. As the outcome of the researches of this able investigator, it has been proved (beyond the power of contradiction) that in the chemical rays contained in light we have a therapeutic agent of considerable value. Moreover, his genius has enabled him to practically apply his knowledge with such good effect that his light treatment has now gained an acknowledged place amongst our most valued remedial agencies. The "Finsen" treatment (as at first introduced) had many drawbacks, not the least important being its expense, and the time occupied in its successful application.

The apparatus designed in Copenhagen, and which was introduced into England at the London Hospital, consisted of a very powerful electric arc lamp of some 10,000 candle power capacity, which consumed 75 amperes of current, at a pressure of 60 volts. The light, after being filtered thru heat-absorbing media, was focussed upon the parts by means of a telescopic arrangement, some three feet in length; four such arrangements being placed round each arc lamp. The whole apparatus cost something like £1,000, and its working entailed an expenditure of £200 per annum.

In order to produce the maximum effect at so great a distance from the source of light, it is necessary that the light rays should be brought to a focus, and thus a very limited area of the diseased surface can be treated at a time, and the length of the sitting is about an hour.

In severe cases, as many as 200 applications were necessary to produce any marked result, a very trying ordeal for the patients. The applications entail a large amount of inconvenience, and whilst, if properly carried out, they

are nearly painless, they are, if successful, followed by a reaction, which is not so. From this description it may be gathered that only in a few cases can the patients stand the strain imposed upon them by the treatment.

Recently lamps have been introduced in which the arc is placed close to the rock-crystal lens. They have the advantage of consuming only one-quarter the amount of current required by the original lamps, cost but a few pounds, the area treated at each application is much larger, and the time of exposure is reduced to from ten to twenty minutes.

There are several patterns of such lamps upon the market, perhaps the best known being "The London Hospital Lamp." In these lamps, the heat rays from the arc are cut off by means of a screen through which water is circulated. In the center of the screen is a projecting lens of rock-crystal through which water also circulates.

The rock-crystal lenses vary from one to two inches in diameter, and the part to be treated is pressed against them. Should the area it is wished to treat be less than the diameter of the lens, the surrounding parts are protected by some opaque material. Thick black paper answers very well. It is necessary for the effective action of the light rays that the part exposed to their action should be rendered as bloodless as possible, hence the necessity for compression.

In this class of lamp the compression is brot about by pressing the part against the rock-crystal lens in the front of the instrument. In the original Finsen lamps the compression was brot about by a specially devised compressor thru which water circulated.

It is my pleasure to introduce to your notice (for the first time) a Lupus lamp of novel construction in which the advantages of the new and old methods are combined.

The lamp is known as the "Cox Lupus Lamp," "Heathcote Patent." It is (Fig. 1) self-enclosed, and the great novelty

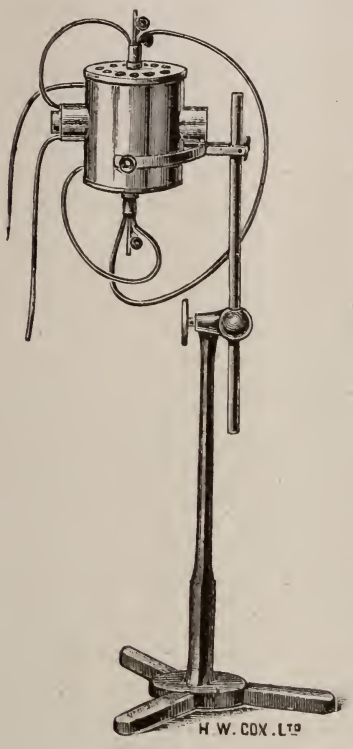

Fig. 1.
The Cox Lupus Lamp.
(Heathcote Patent.)
The stand is firm and rigid, and will allow of the lamp being fixed in any desired position.

consists in the fact that the carbons are kept cool by means of water jackets to within an eighth of an inch of the actual arc. The advantages of this arrangement are:

1. That the carbons being kept cool offer but a very small resistance to the passage of the electrical current, hence a more brilliant light is obtained.

2. That the heat produced is reduced to a minimum.

3. Small carbons can be used.

4. Owing to the small amount of heat generated, a condensing lens can be placed within half an inch of the source of light without any great risk

The whole arrangement is kept cool by means of a stream of water, very little of which is required for the purpose, one pint per minute being amply sufficient.

In addition to the condensing lens the instrument is furnished with a separate rock-crystal lens mounted in a sliding metal tube, which enables the light to be brought to a focus within three or four inches of the lamp. It will thus be seen that this lamp may be used after the manner of the Lortet-Genoud or London Hospital lamp, whilst at the same time it retains the advantages of the original Finsen. If the light be used at its focus, a compressor must of course be used, and the time of exposure must be considerably lengthened.

The special compressor supplied with the intrument can be inserted into the current of water used to keep the lamp cool, and it is so arranged that the water circulates through the compressor before entering the lamp itself. It is thus kept beautifully cool. The water may be supplied from a zinc tank which can be fixed to the wall above the lamp, or from a tap in the usual manner.

A recent visit to the London hospital has convinced me that in certain cases, the original Finsen treatment has distinct advantages; this lamp is therefore doubly worthy of notice, as either method of treatment can be adopted at will.

In actual practice the lamp has in my hands proved a complete success, and I venture to think that with slight modifications it will be a perfect instrument. It has been pointed out that the light rays produced by an electric arc passing between iron, or other metal poles, are much more rich in chemical rays than those produced by carbon conductors, and I am at present engaged in experiments with the intention of testing this theory.

The advantages offered by the new form of lamp have led many to take up the light treatment, who would not have done so under the older conditions.

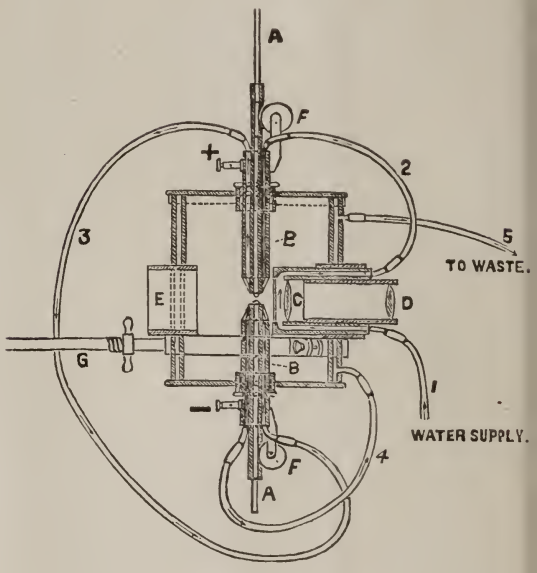

Fig. 2.

Sectional View of the Cox Lupus Lamp.
(Heathcote Patent.)

A. A. Carbons. B. B. Water Jackets for keeping carbons cool. C. Condensing lens, through which water circulates. D. Front lens in sliding tube, for bringing light to focus, or against which the part may be compressed. E. Tube supplied with colored glasses for viewing arc; or for holding a second condensing lens. F. F. Thumb-screws for regulating carbons. G. Arm for connecting lamp with stand. +|- — Binding screws for connecting electric current. The arrows and figures indicate the manner in which the water circulates. When a compressor is used it is inserted into the current between the source of supply and 1.

There can be no gainsaying the fact that at any rate in lupus and rodent ulcer the results produced by the light and x-ray treatment are far more successful than those obtained by any other method. The only question which has yet to be answered is that of permanency, a question which must wait for years for its satisfactory solution. I have recently seen a case of lupus which to all outside appearances was cured by injections of tuberculin; but on examining the patient I noted the fact that all the lymphatic glands in the neighborhood were

very much enlarged and indurated, and I cannot help thinking that in this case the locale of the disease has only been changed.

I have not noticed any changes in the lymphatic glands, in any case which has come under my notice, after either light or x-ray treatment.

The advantages of light treatment with the modified lamp are:

1. The shortness of the necessary exposure.

2. The increased area treated at each operation.

3. The ease with which the instruments can be manipulated.

4. The diminished cost of the treatment.

5. The lessening of its total duration.

6. The reaction, which necessarily follows a successful application, covers a larger area, and the total pain-bearing period is thus considerably shortened.

At the discussion upon these new methods of treatment which took place at the Dermatological Section of the British Medical Association, at Cheltenham, several cases of lupus which had been treated by the Finsen light were exhibited and I was rather surprised to find on questioning the patients, that the x-rays had been also used in each case.

Up to quite recently my knowledge of the treatment of lupus, rodent ulcer, etc., was confined to the application of the x-rays and high tension electrical currents, and I must admit that even now, in my hands, the x-rays produce the best results.

Quite recently a new source of ultra violet or chemical rays has been introduced, and a lamp has been devised which promises to be exceedingly useful. In this lamp (Fig. 3) the light emanates from a rapidly oscillating spark which passes between two metal points. For generating the spark any source of high tension electricity may be used to charge a condenser or Leyden jars, in parallel with the metal points before mentioned, which should be kept about one-eighth of an inch apart. The con-

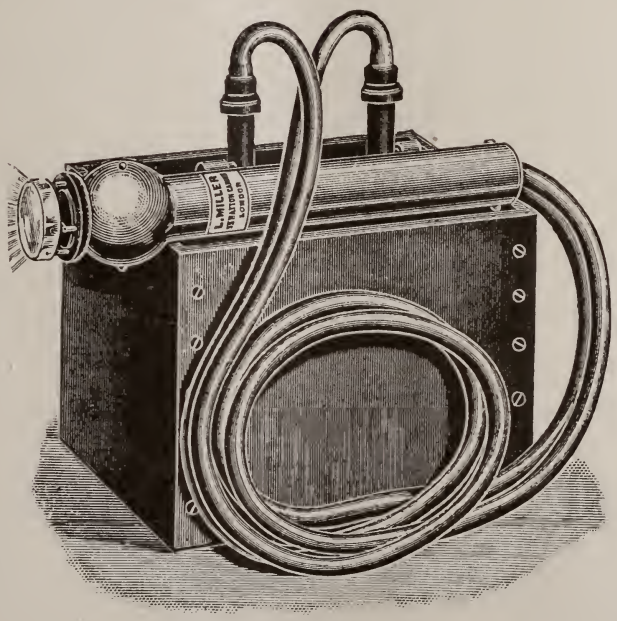

Fig. 3.
Induction Coil Ultra-Violet Lamp.
(The St. Bartholomew's Hospital Lupus Lamp.)

denser discharges across the gap with oscillations at the rate of hundreds of thousands per second, giving out a small amount of visible light, and an abundance of ultra-violet and violet rays. When an alternating current is available a step-up transformer should be used to charge the condenser, but if not, an ordinary induction coil may be used, with a motor mercury break.

The lamp is contained in the end of a long tube, which is connected to the condenser by insulated conductors. The rays are passed through a rock-crystal lens, or a piece of ice, which is used as a compressor. Quite recently it has been suggested that a lens of rock salt may be used with advantage. The great drawback to the use of this lamp is the noise which is caused by the rapid passing of the sparks between the metal points. From the fluorescent effects produced by this lamp, there can be no doubt of the abundance of invisible rays given out; and if the therapeutic effects of the other forms of light treatment are due to the presence of invisible rays, this source of light should prove of great use. I have previously pointed out that if the light treatment of lupus is to be successful, it is an absolute necessity that the parts exposed to the rays should be rendered as bloodless as possible by compression. In certain situations this is a matter of great difficulty, and in some it is at present impossible. Certain devices have already been suggested to overcome these difficulties, and I have little doubt that in the near future we shall so modify our methods, that even the most difficult cases can be successfully dealt with.

Early in the history of the application of the Röntgen rays to practical surgery it was discovered that prolonged exposure at a short distance from a highly charged Crookes or Lenard tube produced injurious effects upon the human tissue, and that the skin and occasionally the deep structures were destroyed or seriously injured. Certain observers came forward who spoke of beneficial effects; some of which were no doubt largely due to imagination, and others to a combination of circumstances in which the x-rays played only a small part.

The first paper of importance pointing out the dangers produced by the unscientific application of the x-rays was written by Nikola Tesla, the famous New York electrician, who not only described the ill effects which followed prolonged exposure at a short distance from a highly charged Crookes tube; but described methods whereby these ill-effects could be avoided. The effects produced upon the skin and nails of the hands of constant experimenters proved beyond all doubt that some physiological action was taking place; and from numerous accidents which have been reported from time to time in the medical journals, it is absolutely certain that in the ignorant application of the x-rays, we have a danger which renders it necessary that their use should be restricted to skilled hands. During the six years I have engaged in the practical application of x-rays to medicine, and surgery, I have had only one case in which deleterious effects were produced by such an exposure as is necessary to produce a negative for the purposes of diagnosis. This occurred in the case of an officer, who was sent to me, whilst in South Africa, for the purpose of localizing a bullet which had lodged in his spinal column. Two exposures were given, each of twenty minutes' duration, the tube being placed at a distance of eleven inches from the skin. The lengthy exposure here given was rendered necessary by the fact that the

amount of the electrical current at my disposal was extremely small.

Two days after the exposure, my attention was drawn to a slight dermatitis over the lower part of the chest, and upper part of the abdomen, accompanied by slight pain and burning. The application of an evaporating lead lotion allayed all symptoms in twenty-four hours. I attribute the accidental production of dermatitis in this case, to the lowered vitality of the patient, consequent upon a severe injury to the spinal cord, accompanied by paralysis of the lower limbs and sphincters. Recent improvements in apparatus have rendered the time of exposure which is necessary for the production of a radiograph so short that in skilled hands we should hear no more of the accidental production of x-ray burns.

Under the conditions which now exist, an exposure thru the thickest part of the body should not occupy more than three minutes, and moreover, the tube can be placed further from the body than was formerly the case. The fact that the skin could be destroyed by prolonged exposure at a short distance from an x-ray tube, together with the knowledge that protection could be afforded to parts which there was no reason to affect, early led experimenters to try the effects on certain diseases of the skin, where destruction of the tissues by cautery or caustics, or removal by operation, had hitherto been resorted to.

During the experiments in this direction it was found that in certain cases a beneficial effect was produced before the application had gone sufficiently far to result in actual destruction of tissue, and the effect of a series of fairly lengthy exposures, at what is known as a safe distance from the tube, produced results in cases of lupus and rodent ulcer which pointed to a field of usefulness for the new method.

From all parts of the world have come news of cures brought about by continued short exposures to the x-rays, and there can be little doubt that with increased knowledge we have at hand a therapeutic agent of considerable value. Cases of lupus, rodent ulcer, eczema, ringworm, favus, sycocis, psoriasis, elephantiasis, lepra, nevus, acne, etc., etc., together with chronic ulcers, have been treated with good effect, and latterly certain forms of cancer have been materially benefited by x-ray treatment.

There are many points in such treatment which call for attention, the chief being the kind of tube which is best adapted for therapeutic purposes. By the kind of tube I do not refer to the particular pattern, but rather to the condition of vacuum which is best suited to our purpose.

Tubes have been divided into three classes—soft, medium, and hard, the terms having relation to the degree of vacuum. A tube in constant use rapidly passes from one condition to another, but it has been pointed out by many observers that a soft tube is much more likely to produce dermatitis than either of the others.

A soft tube is one in which the violet cathode rays can be seen passing from the cathode to the anti-cathode, and which shows the bones of the hand black upon the screen.

A medium tube is one in which no violet cathode rays can be seen, and which renders the bones transparent.

A hard tube can only be excited with difficulty, and frequently has to be heated before a spark can be made to pass thru it. This last is by far the best for therapeutic purposes; and it is also by far the most difficult to deal with successfully.

In a paper which I read before the British Medical Association at the annual meeting at Portsmouth in 1899, I stated that, in my opinion, the effects produced were largely due to the near presence of an electrical current of high potential; and altho I drew attention to the fact that, sooner or later, I might have to modify those views, I am still of the opinion that electrostatic or electrolytic action plays some part in the production of the results.

It is exceedingly difficult to isolate the purely x-ray from the electrical effects, and much time must elapse before we are in a position to say what part each plays in the therapeutic effects produced. We have at hand ample evidence that the fine streamers which proceed from an "Oudins Resonator" have in themselves marked therapeutic effects; and altho I have some evidence that the x-rays of themselves have similar properties, it is at present impossible scientifically to separate the one set of phenomena from the other. There are many points in the actual application of the x-rays to therapeutics which call for attention, not the least important being the best means of protecting the surrounding parts from the action of the rays. In my early experiments, when I worked with the intention of producing an actual x-ray burn, I adopted the plan of painting over the surrounding parts with a thick layer of either iodoform or bismuth, suspended in gelatine. (Edinburgh Medical Journal.)

In these cases one to three exposures at a distance of one inch from a highly charged Crookes tube produced the desired result; and the method adopted for protecting the healthy tissues proved highly satisfactory. With the continued treatment such a method of protecting the healthy tissues involves far too much trouble, and screens or masks, covered with some more or less opaque substances, are now generally used. A hole is cut in the screen or mask, which allows the rays access only to the parts it is desired to treat. Tinfoil and sheet lead are the substances most commonly used, but I have found that dermatitis much more commonly follows the use of such screens than with those which, although less opaque, are non-conductors of electricity; and I cannot help thinking that as the metal-covered screens become secondary condensors; which during the action of the tube are highly charged with electricity, they are apt to produce unlooked for results. If any portion of such a metal screen touches the skin a burning sensation is felt, and if continued for any length of time a dermatitis usually follows. I have obviated such a danger by enclosing the metal shield between two sheets of cardboard, or other non-conducting material; but screens made of gutta-percha, india-rubber, cardboard, or thin wood, painted with a thick layer of bismuth, or oxide of lead, have proved even more satisfactory. Masks have an advantage over screens, as they can be fixed to the parts, and obviate the tiresomeness of their having to be held in position.

The latest method I have adopted, and one which appears to have many and great advantages, is to enclose my tube in a box lined with some opaque substance, leaving only a hole in the front through which the rays can pass. This hole is preferably made circular, and is so arranged that tubes of varying length made of vulcanite or cardboard, can be fixed in them as desired. The tubes themselves are also lined with opaque material to within a quarter of an inch of their free ends. The advantages of this method are that the patient can hold the part it is wished to expose to the rays to the end of the tube, without any

fear of getting too close, and diaphragms of varying size can be used over the end of the tube to protect the surrounding healthy skin.

I have devised an apparatus (Fig. 4) for holding such enclosed tubes in position for therapeutic purposes, or it can be utilized for taking radiographs. Negatives produced in this manner are much more sharp than those taken by the ordinary methods.

duction of pigmentation. This naturally differs in different individuals; but it is rarely entirely absent in any case which is being benefited by either method of treatment and I always look upon its production as a favorable sign.

Patients differ to a very marked degree in their susceptibility to the influence of the x-rays; and it is necessary at first to proceed with great caution if disastrous results are to be avoided.

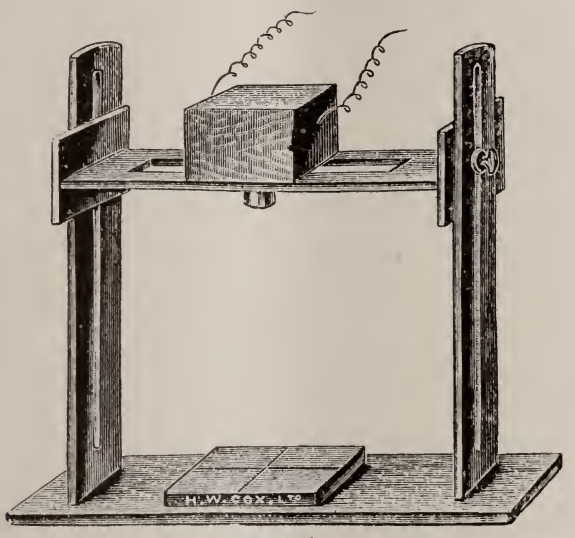

Fig. 4.

The Hall-Edwards Therapeutic, Localizing, and Stereoscopic, X-Ray Tube Holding Stand.
The box containing the tube is square, and is held in position upon the stand by runners. The tube can (by altering the position of the box) be pointed in any desired direction as the necessities of the case under treatment may require.

In later experiments, I have packed my tube in the box with a non-conducting, opaque material, which appears to yield even better results. I shall hope, however, to be able to say more on this point later on.

I have not the slightest hesitation in saying that the results obtained by these methods are much more satisfactory, and the freedom from risk of producing an accidental dermatitis is a great relief to the surgeon.

There is a similarity in the effects produced alike by the light treatment and the x-rays, to which I should like to draw your attention. This is the pro-

One application of ten minutes' duration, at a distance of eight inches from the tube, may produce a dermatitis in one case; whilst in another, six or eight applications may be administered under exactly the same conditions without producing any recognizable effect.

Albers Schönberg, who has successfully treated a large number of cases of lupus with the x-rays, lays great stress upon the undesirability of setting up a dermatitis. He disapproves of using heavy currents, and points out that in his experience no beneficial effect is produced on lupus of the nasal mucous membrane. In this latter contention I

agree with him; at the same time, I should like to point out that some of my best results have been obtained in cases in which the mucous membrane of the lips was affected.

I disagree with him entirely as to the effects of setting up a limited amount of dermatitis in cases of lupus. In these cases the dermatitis produced differs considerably from that produced accidentally upon healthy skin. It quickly heals, and the ulceration is superficial. Taking into consideration the older and more or less successful methods of treating lupus, such treatment would certainly not be taken as being unscientific, and I see no reason why a limited amount should not be purposely produced. Indeed, in cases in which there is one small or medium sized patch, situated anywhere but upon the face, I have no hesitation in destroying the whole area at one exposure, of from fifteen to twenty minutes, at a distance from one to two inches from the tube. In my first experiments some four years ago, I produced in each instance an extensive x-ray burn by giving two or three such exposures, the distance between the skin and the tube being only one inch. The ulcers formed took months to heal, and although the final results were good, I should not advise such treatment in any but exceptional cases. In certain forms of superficial cancer, such treatment might possibly prove beneficial.

As regards lupus and rodent ulcer, there can be little doubt that in the x-rays we have a therapeutic agent of considerable value, and whilst I would not (at present) go so far as to state that all other methods of treating these diseases should be abandoned, I feel certain that in conjunction with the already accepted methods, it will be proved that these troublesome diseases have lost some of their terrors. The scar tissue which follows the successful treatment of lupus by the x-rays is soft, pliable, and natural in color. There is no contraction, no loss of tissue, and the pigmentation produced disappears in the course of time. Whether or not the results produced are permanent, yet remains to be proved; but even granting that they are not, the relief obtained is far greater than that produced by any other method (with the exception of that which follows light treatment), and as I have before stated every successful case which has been publicly exhibited is the outcome of the two methods combined. Recently it has been stated that the treatment of lupus erythematosus has not been successful. Many cases of cure have been reported from the continent and America, and some 3½ years ago I treated one with complete success. The disease has not recurred and the patient is now in perfect health.

During my absence in South Africa I had to completely discontinue my experiments; since my return, however, I have treated a large number of cases with varying results. On the whole they are satisfactory, but in a few little response has followed the treatment. This may be due to the non-efficiency of my methods, to the fact that some cases are not in any way effected by the x-rays, or to the treatment not having been sufficiently prolonged.

In describing the phenomena which follows the successful application of the x-rays, some observers have stated that the healing process always commences in the centre of the patch under treatment, and that the edges are driven out, and are only dealt with, with considerable difficulty. In my hands the opposite result has been obtained. My cases as a general rule commence to heal from the edges of the patches, and whilst a

few nodules may remain unaffected, the healing process gradually extends inwards. I attribute the effects described to the using of too small a hole in the screen or mask. My invariable rule is to expose at least a quarter of an inch of healthy (or apparently healthy) skin beyond the defined margin of the patch. Should the screen be smaller than the patch, it is obvious that its centre gets more exposure to the rays than its edges and the result complained of is only what can be expected.

In treating a small patch, the hole in the screen should be larger than the area of the disease, and if it is thought unwise to treat the whole of the diseased surface at once, treatment should be commenced at its edges. It generally happens that one or two isolated nodules remain after the general surface is cured. These are most difficult to deal with, and a change of treatment is indicated. The reason for the escape of these nodules is not forthcoming, but it may be due to their implicating the deeper layers of the skin, which have not been touched by the treatment. It is curious to note that whilst the x-rays pass completely through the parts submitted to them, it is only the superficial surface which is markedly affected. This fact of itself goes to prove that electricity plays no small part in the production of the results, as one would imagine that the whole thickness of the tissues must to an extent be affected, if the x-rays themselves alone are concerned.

The excellent and successful results obtained in the treatment of rodent ulcer by the x-rays point to a well nigh specific action in this particular disease, and inasmuch as it is closely allied to cancer we had good grounds for hoping that in certain forms of this terrible malady some good results might accrue.

Our predictions in this direction have already proved true, many cases of cure having already been reported, and in cases in which all hope of cure had been abandoned considerable relief has been afforded. So far, most of the cases in which relief has been obtained are of a superficial character, but we have some evidence that deeply seated lesions are to an extent affected. We have good reason to believe (from experimental evidence to hand) that continued research in this direction will yield even better results than those already obtained, and altho we cannot dare to hope that all forms of cancer may be relieved or cured by x-ray treatment, the results secured are sufficiently encouraging to warrant continued research. In several cases which have come under my notice, pain, which could not be relieved by drugs, has disappeared after a few exposures, even in cases in which the disease was so far advanced that all hope of successful treatment had been abandoned.

A large number of cases have recently been published by Dr. Morton of New York. In each, considerable relief was obtained from the treatment. The growths diminished in size, and the pain disappeared.

At the present time there is a considerable difference in the methods adopted by various observers, but all agree that in the x-rays we have a promising therapeutic agent for combating the most fearful diseases known to surgeons. A modification of our methods may bring about better results, and inasmuch as in skilled hands the x-rays can do no harm, there is no reason to condemn their application in any case which, in the ordinary condition of things, has been pronounced inoperable.

The application of light and the x-rays to therapeutics is as yet in the ex-

perimental stage, and altho the results produced are more than satisfactory, it is impossible to lay down any definite rules of procedure. In the near future I hope to lay before you a more complete plan of campaign, and I must impress you with the fact that some of the statements made herein may have to be contradicted; or at any rate materially modified.

PRATICAL X-RAY DIAGNOSIS.

Prepared by J. Rudis-Jicinsky, A. M., M. D., M. E. Cedar Rapids, Ia. Revised by M. U. Dr. Joseph Hoffman, Vienna, Austria.

A series of A B C teaching for workers in X-ray diagnosis and therapeutics, to be concluded in 20 lessons. Fully illustrated.

The Intensifying Screens.

LESSON XII.

In the beginning of my x-ray work the developing and printing of my plates I have intrusted to a photographer, but I soon found out that he could not properly read the negatives, and it was impossible for him to tell if the details were brought out clear enough, and pathological or anomalous conditions definitely displayed, or the negative sufficiently intensified. Since then I do the developing and fixing with him, and we intensify every negative, trying to overcome all other difficulties in printing which do not exist in ordinary photographic work. If we wish to shorten our exposures and bring out all the detail possible in our negatives, the internal structure of the bones, and not only the shadow but the substance or the layers of the soft tissues, with a depth and a perspective to our picture, we have to use the intensifying screens in our work and guard the plate against under-exposure.

In the beginning of this and such experiments, we may expect some blurring in our negatives on account of the grains of the screen or improper manipulation of the tube in exposure.

When photographing thick parts of the human body, such as shoulders, chest, pelvis, or buttocks, which necessitate a great distance of the Crookes tube from the object, two intensifying screens are needed for the purpose of considerably reducing the time of exposure and obtaining more detail in the negative. These screens are a distinct advantage. The prepared side of the screen is placed against the prepared face of the dry plate, so that the susceptible side of the screen rests on the sensitive surface of the plate. Then the plate, together with the screen, is put into a casket or envelope, and the whole exposed to the rays emitted from the tube. The sensitive side of the plate together with the screen lies upward. In using plates with two sensitive sides, there we have to have two intensifying screens. The time of exposure in some cases is shortened from minutes to seconds. Thin objects are easily over-illuminated. It takes a little study to find out exactly the proper time of exposure, which certainly is different in every given case, but if we work with Crookes tube known to us, a tube which we use daily, with a proper understanding of the nature of the shadows cast upon the fluoroscopic screen or the photographic plate, it soon becomes easy to take a skiagraph altogether different from those seen usually, and made without the screens. The intensifying screens are tungstate of calcium crystals of very fine grain on a pasteboard in one or more layers. The screens are not affected by use, but must be of fine grain only to give the best results. When out of use, keep them in a cardboard case frame or a box, and

guard them against bending when not flexible. If we would like to bring out still better details in the bones or the layers of soft tissue, or even arteries sometimes, we may use the screens and a lead plate, as a support to our dry plate. This way we have another cathode in the lead backing (about half or one inch in thickness), and may be able to overcome the blurring in our negatives, especially, if two tubes are used, one anteriorly and the other one posteriorly. Such experiments are very interesting.

During exposure the parts to be photographed must be firmly bound and fixed to the plate, and adhesive plasters or weights may be used on the limb above and below the plate. Remember, tho, that some adhesive plasters, especially those containing subacetate of lead, zinc, etc., may show in your picture.

We may also place two or more dry plates and screens, with film sides up, in the casket or envelopes and see that under the action of the x-rays the plates will be affected, but in decreasing degree. One plate may show us a full exposure of the interior parts of the body; another under the same exposure certain other parts, like the heart and other internal organs, or the interior structure of the bones.

These tungstate of calcium screens, properly protected in a frame, may be used also under a ground glass plate for marking one's findings with a pencil in diascopic examinations of the chest, etc.; or we may replace the fluoroscope and exhibit the fluoroscopic effects in a dark room to more persons present at one time. In this way we have more uses for the application of the intensifying screens. Now, for instance, in order to recognize shadows that may be produced by pleuritic adhesions in chest examinations, it is desirable to have a separate flexible screen of barium platino-cyanid, or use again our intensifying screen with a narrow slit, so that the shadows of the organs above and below are excluded. These thickenings of the pleura are best recognized by the fact that the ribs passing over them have slightly sharper edges and the outline of the lung is not quite so clear. Further, any alteration in the manifestation of functional activity of the thorax, may be studied well with the screens which furnish us a valuable addition to the ordinary methods of investigation.

The Operating Table. The Measuring Stand Fluorometer.

LESSON XIII.

Most medical and surgical cases require a reclining position of the patient in examination, and in skiagraphy the proper position being important, we must have for our operation not only a good table adjustable for all parts of the human body, but also some means of localization. The ordinary surgical tables may be used with a measuring stand for our investigation, separately or the fluorometer, which measures the position and the side of internal parts or foreign objects contained in the human body and is the best localizer, may be employed with a table. The fluorometer supports the body well, receives the plates with or without the screens better, and facilitates operations with the tube held below or above the table.

*Fig. 1 shows Hoffman's measuring stand, which consists essentially of a square frame which can be moved up and down between two pillars. These pillars are connected by a transverse beam at the top and at the bottom they are fixed to a board which forms a floor Upon this floor the person to be exam-

*Figs. 1 and 4 too late for publication.

med stands or is seated. If necessary a table may be used. Fig. 2. The movable frame is furnished on all four sides with rails of brass, on which the brass slides clutching the rails in hook-like

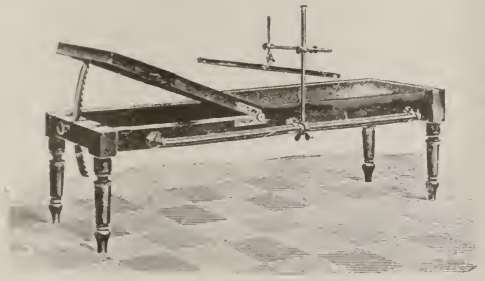

Fig. 2. Operating Table.

form, glide. Each two opposite slides are connected with a spiral spring of steel wire. Of these movable wires three are vertical and three horizontal. Alongside the rails is placed a scale divided into millimeters so that the distance of the parallel stretched wires may be continually read. As the frame and screen are both held in position by the stand, both our hands are at liberty, and the slides gliding on the brass rails may be moved to set the wires at any desired point. By means of two movable wires, a point may be accurately noted; by means of four wires an organ, for example, the heart, can be framed. And, if a further wire is set to a certain point in the body one can determine the position of the organ in the body to a certain degree of accuracy.

The Dennis fluorometer (Fig. 3) enables us to ascertain still better, and with more exactness, the position which any organ or foreign body, fragments of the bones, etc., seen on the field of the fluoroscope, occupy in the human tissues. To accomplish this result it provides:

"A position of the body or limb, by which what may be called for want of a more precise term a perfected shadow, is thrown on the field of the fluoroscope, or on the sensitive plate, film, or paper, at the same time giving the surgeon data which will not only enable him to make his measurements, but to reproduce the exact position of the body or limb, for purposes of exploration or operation. In other words, it eliminates the element of distortion in the shadow caused by the changing position of the

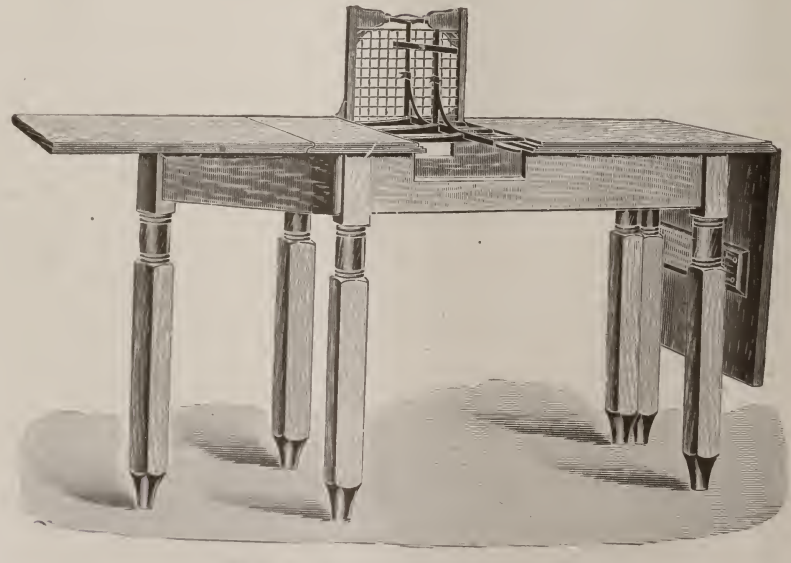

Fig. 3. Dennis Fluorometer.

body or the limb." This apparatus combines the operating table with a localizer.

Fig. 4. Fluorometer Appliance Adjusted to Position of the Patient Examined.

"The distortion caused by the position of the subject having been eliminated, the fluorometer provides an accurate cross-section of the body or limb, and supplies an absolutely correct right angle, at the intersection of the lines of which the foreign object will be found in the body; or the fragments of the fractured bones may be seen without moving splints in the limbs, and better adjusted; organs of the body examined; consumption measured in the lungs

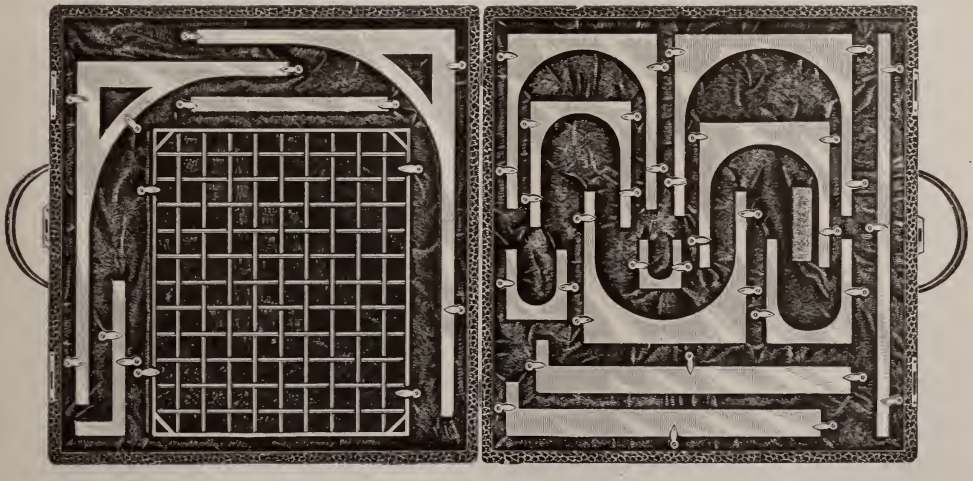

Fig. 6. Lot of Metallic Angle Pieces of the Fluorometer.

liver and joints, and detected in its incipient stages. In cases of stones in the kidney or gall-bladder, the line of incision may be given when diagnosis is made; the focus of the diseased bone may be shown and marked; examination of the progress of bone grafting, etc., made correctly, and proven beyond doubt. For medico-legal cases, there is no better localizer as yet. The fluorometer consists, (Fig. 6), essentially, in a set of metallic angle pieces which conform generally to the shape of the body or limb, and which, in their use in connection with the x-rays, are susceptible of being squared with a simple and adjustable table. The patient being laid on the table and a fluorometer appliance adjusted, as shown in Figs. 4 and 5, the fluorometer is brought with the body into the parallelism of the rays; that is, when the proper position of the cross-section is obtained, the two arms of the fluorometer will present the characteristic single shadow on the field of the fluoroscope. This is the most easy method of localization for both skiagraphy and fluoroscopy, the most practical, quick and uncomplicated. If it be desirable to preserve a record of the observations, all that is necessary is to produce a fluorograph, by substituting a sensitive plate, film or paper, for the field of the fluoroscope back of the grating, and making the necessary exposure.

Stereo-Skiagraphy.

LESSON XIV.

If we take two reversed pictures of one case and view them stereoscopically, the pictures of objects possessing three dimensions are seen not as plane representation, but with an appearance of solidity or relief, as in ordinary vision of the objects themselves. Dr. James McKenzie Davidson and Dr. G. P. Girdwood have made stereoscopic skiagraphs with the Wheatstone sterescope to get the effect of perspective in their pictures, and to help the surgeon to locate more accurately the lesion sought and avoid the distortion in the shadow, from which we are liable to draw incorrect conclusions. Eugene W. Caldwell combined the stereoscopic effects in the fluoroscope, and gave us a vacuum tube with two sources of x-rays within one and the same chamber and a fluoroscope with rotating shutter driven by an induction motor.

The Wheatstone stereoscope consists of two square mirrors, fixed vertically with their backs at a right angle to each other, two slides for the reception of pictures made specially for this purpose, the left hand picture being placed in the right hand slide, and vice versa, on account of the lateral inversion of their reflected images. The slides move along the arms made for this purpose, so that their distance from the mirrors may be varied at pleasure. Each slide also revolves on a vertical axis, to admit of variation of its angular position with the reference to the arms, which may also be moved in a horizontal plane on a common pivot. The pictures being attached to the slides, the observer places himself with his nose close to, and immediately in front of, the vertical angle made by the reflectors, so that the view by each eye is limited to the rays reflected by its appropriate mirror. The pictures are then seen, as it were behind the mirrors, and the eyes being made slightly to converge, either by an effort of the will or by drawing the slides a little forward, (the effect of which is to refer the reflected images to the same part of space), the observer sees no longer mere pictorial resemblance, but to all appearance the objects themselves modelled and standing forth. Girdwood

takes two skiagraphs of the part, the tube being moved to a distance of 2½ inches to the right or left of the original position between the taking of the two pictures, the part skiagraphed remaining in the same place. If the platinum plate in the Crookes tube was so placed in each case that a normal from the surface thereof would strike the same spot then the two skiagraphs would present exactly the same differences as the pictures presented to each eye would have, and the skiagraphs so taken would give the true stereoscopic effect of seeing every part of the picture in its proper relative position to surrounding objects.

The process given by McKenzie Davidson differs from the above only in not making the normals of the platinum distributor in the Crookes tube in the two positions converge. His are taken as though seen with two eyes, whose axes are parallel instead of converging on a point 12 inches distant, representing the appearance represented to each eye, when the axis of vision is convergent. He has two x-ray tubes placed a short distance apart and excited alternately by an induction coil or two with switch mechanism for the tubes. In the field of these x-ray tubes he places a stationary fluorescent screen in front of which are two sight holes having a shutter actuated synchronously with the changing of excitation of the two x-ray tubes.

Caldwell's invention is the latest, and is so important that his report (Electrical Review, November 16, 1901), is reproduced here with certain modifications, as follows:

"It is, of course, essential with this work to keep in operation two x-ray tubes which produce approximately the same effect upon the fluoroscopic screen. This is not an easy thing to do. It is well known that the character of the radiations from x-ray tubes depends much upon the degree of their vacuum and this is subject to wide variations during use, and will never remain exactly the same in two tubes. Both of the methods described for exciting the two tubes alternately involve the use of switching mechanism which are somewhat complicated. Finally, the use of a stationary fluoroscopic screen, although it ensures the greatest accuracy, makes the machine somewhat clumsy for the examination of injured and tender limbs, which must be handled carefully and which sometimes may not be placed in proper position before the fixed screen without great discomfort and even risk of causing further injury.

"In Edward M. Gibbs' X-Ray Laboratory at the University and Bellevue Hospital Medical College, an attempt has been made to overcome some of these practical difficulties and a stereo-fluoroscopic system has been developed which seems to me in some respects simpler and easier of manipulation that the one just described, although its principle of operation is the same. The two sources of x-ray are obtained by passing a high potential alternating discharge through a double-focus tube having its anti-cathodes separated by about three inches. The alternating discharge may be obtained in various ways, but in the method shown here it is produced by supplying the primary winding of an ordinary induction coil with an alternating current which is broken during each alteration by a liquid interrupter. The two sources of x-ray are within the same vacuum chamber, thus eliminating the chief difficulty in the way of obtaining from both of them radiations of the same strength and character. The method shown for exciting this tube dispenses entirely with switching mechanisms for

changing from one source of x-ray to the other.

"Such a tube is, in fact, easier to operate than an ordinary single-focus tube if the current supply is from an alternating incandescent circuit.

"The fluoroscope used with this system is movable and resembles the ordinary fluoroscope. It is provided with a rotary shutter which permits only one eye at a time to view the fluorescent screen. This shutter is a toothed wheel which is the rotor of a small synchronous alternating current motor. This motor may be of the mono-phase type, in which case the revolving shutter is made of steel and magnetized, but it is preferable to use a poly-phase or split-phase field winding, and make the rotor of soft iron. The motor shutter is, of course, supplied with alternating current from the same source as the induction coil, and therefore operates synchronously with the alternations of current through the coil and the discharges through the double focus tube. The shutter can, of course, be arranged to operate with an interrupted current, but the alternating current is better in many respects."

OUR OFFER.

Chicago physicians who will send us $3.00 subscription for the AMERICAN X-RAY JOURNAL for one year, and who so request, will be proposed for membership in the Chicago Electro-Medical Society, and we will pay their membership fee of $3.00 for one year. We make this offer solely in the interest of the physicians of Chicago.

An amusing feature of the French Automobile Tax lies in the predicament of an erstwhile motor-cylist in that country. Two years ago the individual in question was the proud possessor of two motor cycles, on which he willingly paid the annual tax assessed by the laws of the country, and in return was provided with two of the regulation number plates for attachment to his vehicles. One day a second individual came along and appropriated the motor cycles without asking their lawful owner's permission; in other words, they were stolen, and with them, of course, the number plates. The French government still continues to tax the original owner, owing to the fact that he has not returned the labels—an omission which entitles the powers that be to the assumption that the cycles themselves are still in his possession. Verily the law is an ass. —Electricity.

Lynn, Mass., April 12, 1902.

Dr. Heber Robarts,

301 Chemical Bldg., St. Louis, Mo.

My dear Sir: In reply to yours of April 12, I would say that I first made stereoscopic x-ray pictures in the summer of 1896, and published a statement of the method, with an example of the stereoscopic radiograph, in the Electrical World of October 10, 1896, to which I refer you. Other papers at the same time made similar announcements of stereoscopic radiography.

I may say that I followed up the work at the time by producing other pictures on occasion, and using the method for examination of fractures, the last instance of the kind being in the year just past, when my eldest son suffered from a Colles' fracture of the left wrist, the position of the bones being examined by the stereoscope, using a pair of stereoscopic radiographs.

I have always believed in the great utility of this method, since it enables one to see at once the actual position of the parts in place. Yours very truly,

ELIHU THOMSON.

EDITORIAL NOTES.

American Electro-Therapeutic Association.

The twelfth annual meeting of the American Electro-Therapeutic Association was held on Tuesday, Wednesday and Thursday, September 2, 3, and 4 at Hotel Kaaterskill, Catskill mountains, New York. It was one of the most enjoyable and brilliant meetings ever held by this Association, among the Rip Van Winkle hills and in a center of culture and science. The best known x-ray and electro-therapeutical experts in this country were present. In most of the papers read the interest centered on x-ray therapy, and in fact it could appropriately be called a Roentgen ray meeting pure and simple. There has been a marked radical change in sentiment favoring the x-ray since the Roentgen x-ray meeting held in Buffalo last September. At that time its therapeutic value was looked upon with suspicion, and those who favored it had even their professional standing questioned. During the last twelve months malignant diseases have been taken out of the list of incurables and placed on the list of curables.

The meeting was called to order by its President, Dr. Fred H. Morse.

The following scientific papers were read:

The Action and Uses of the X-Rays in Therapeutics, by W. B. Snow, M.D., New York.

On the Treatment of Cancer by X-Rays, by Clarence Edward Skinner, M. D., LL.D., New Haven.

The X-Rays in the Treatment of Cancer With Report of Cases, by J. D Gibson, M.D., Birmingham, Ala

Epithelioma of the Tongue and Some Therapeutic Notes on the X-Rays, by Charles R. Dickson, M.D., Toronto, Canada.

A New System for Producing a Slow, Alternating Current of Large Amperage for Therapeutic Use, with Citation of Cases and Exhibition of the Apparatus, by Lucy Hall Brown, M.D., Brooklyn, N. Y.

Some Therapeutic Indications from the Use of the Electric Light Bath, by T. D. Crothers, M.D., Hartford, Conn.

Some Obstacles to the Progress of Electro-Therapeutics, by Chas. O. Files, M. D., Portland, Me.

Portable Electric Apparatus for Medical Use, by Robert Reyburn, M.D., Washington, D. C.

Newman's Portable Galvanic Battery, by Robert Newman, M.D., New York.

The Diffusion of Iodine by the Electric Current, by M. F. Wheatland, M.D., Newport, R. I.

Arthritis Deformans, by Francis B. Bishop, M.D., Washington, D. C.

The Relationship of Psychic Suggestion to Electro-Therapeutics, by Maurice F. Pilgrim, M. D., Boston, Mass.

Personal Observation Touching the Medical Value of the Roentgen Rays, by R. J. Nunn, M.D., Savannah, Ga.

Illustrative Cases in the Kataphoric Treatment of Cancer, by G. Betton Massey, M.D., Philadelphia.

Current Differentiation Illustrated by a Case of Peripheral Neuritis due to Parenchymatous Degeneration of the Cord, by A. D. Rockwell, M.D., New York.

The following gentlemen took part in the proceedings: Dr. G. Betton Massey, Dr. Robert Newman, Dr. W. H. White, Dr. C. O. Files, Dr. Francis B. Bishop, Dr. J. D. Gibson, Dr. Chas R. Dickson, Dr. M. F. Wheatland, Dr. Maurice Pilgrim, Dr. R. J. Nunn, Dr.

A. D. Rockwell, Dr. William Stevens, Dr. T. D. Crothers, Dr. Lucy Hall Brown, Dr. Robt. Reyburn, Dr. C. Frank Osman, Dr. W. J. Morton, Dr. H. P. Pratt, Dr. Geo. E. Bill, Dr. W. B. Snow, Dr. Clarence Edward Skinner, Dr. Albert C. Geyser and others.

The next meeting will be held at Atlantic City, September 23, 24 and 25, 1903.

The following officers were elected for the ensuing year.

Dr. D. R. Brower, of Chicago, President.

Dr. Maurice F. Pilgrim, of Boston, Vice-President.

Dr. C. Frank Osman, of Boston, Vice-President.

Dr. Clarence Edward Skinner, of New Haven, Conn., Secretary.

Dr. R. J. Nunn, of Savannah, Ga., Treasurer.

Other papers were read by title.

Some of the personages present who are well known as pioneers in special lines of work were Dr. A. D. Rockwell, the author and writer, the father of electro-therapeutics in this country; Dr. Robert Newman, author and writer and pioneer in the treatment of stricture by electrolytic methods; Dr. G. Betton Massey, of Philadelphia, author and writer, the father of the American Electro-Therapeutic Association, and a pioneer in the kataphoric treatment of cancer by his method of sterilization; Dr. W. J. Morton, of New York, author and writer, inventor of the well-known Morton Wave Current; Dr. Robt. Reyburn, of Washington, author and writer, the only surviving surgeon who attended the late President Garfield in his last illness; Dr. D. R. Brower, of Chicago, the well-known mental and nervous specialist, and Dr. H. Preston Pratt, of Chicago, the pioneer in x-ray therapy.

Electro-Therapeutics at the World's Fair of 1904.

What will probably go down into history as one of the most important and enjoyable conventions of the American Electro Therapeutic Association closed on the 4th of September. The convention assembled at the Kaaterskill Hotel, Catskill mountains, on the 2nd of September, and everything combined to make the setting of the meetings all that could be desired. The papers on the treatment of cancer by x-ray attracted the burden of attention and brought out most interesting, pertinent and profitable discussions. There were, however, a number of most valuable papers read which bore upon other phases of the electro-therapeutics; in fact, so comprehensive was the programme that each session had a new attractiveness, and as a result the readers faced large audiences at all times.

Among the important matters considered by the convention was the place to be given to electro-therapeutics at the World's Fair of 1904. The subject was presented to the convention thru the President by recommendation of the Executive Committee, and a very animated discussion ensued. The trend of the discussion showed that the members were greatly interested in having a true picture of what is being accomplished in electro-therapeutics along strictly scientific lines presented for the criticism of the world. There was a strong feeling that too much light cannot be thrown upon electro-therapeutic methods; that no effort is too great which will stimulate the medical and electrical professions to earnest search after truth; that every effort must be made to instil confidence in that which is good and brand with its proper mark all charlatanism. At the close of the debate, by unanimous

vote of the convention the following resolution was passed:

Whereas, there is to be held in the City of St. Louis in 1904 an Exposition of the Arts and Sciences of the world, as an expression of our advanced civilization; and

Whereas, we understand that the provisions to be made for the exhibit and visions to be made for the exhibit of the progress of electricity will be adequate, and feel that electro-therapeutics are deserving of special recognition. Therefore, be it

Resolved, That the American Electro-Therapeutic Association heartily commends and supports the plans that have been inaugurated for organizing an electro-therapeutic exhibit commensurate with the dignity and importance of this branch of electricity.

There was a strong sentiment expressed in the discussion of this resolution in favor of the Association being represented at the Exposition by an appropriate exhibit of the work which it has accomplished; and to further the project and to lend such assistance as may be possible to the Department of Electricity in arranging for the general electro-therapeutic exhibit at the Exposition, by vote of the convention, the President of the Association was empowered to appoint a special committee of the Association on electro-therapeutics at the Louisiana Purchase Exposition.

Prof. W. E. Goldsborough, chief of the Department of Electricity at the Exposition, was present at the convention and by invitation of the President explained the plan and scope of the Exposition and the immensity of this international undertaking. His address was received very warmly by the members, and a strong sentiment developed in favor of holding the 1904 meeting of the Association in St. Louis.

The St. Louis World's Fair will without doubt be the greatest and grandest exposition ever held, and this early action by the American Electro-Therapeutic Association cannot be too highly commended. It will undoubtedly result in greatly assisting the universal dissemination of the knowledge of the value of electro-therapeutic methods by stimulating activity in the production of exhibits that will have a distinct educational value.

It is high time that a more general appreciation should obtain of the great good that can be done by the proper and scientific use of electricity in the treatment of disease, and it is very gratifying to know of the progressive and strenuous efforts that are being put forth by the Exposition to afford every facility for the building up of this joint branch of electricity and therapeutics on broad and highly scientific lines.

At the last meeting of the American Electro-Therapeutic Association, in the course of remarks concerning the treatment of cancer by x-rays, and bearing upon the question as to the relations of surgical operations and the x-ray, Dr. Morton incidentally read the following quotation from a private letter, refraining, of course, from giving the name of the surgeon or of the patient. The surgeon, however, is one of the distinguished operators of New York City. The quotation is as follows: "I am an absolute pessimist regarding the curability of such cases by surgical operation and only operate with that motive in view out of deference to current surgical opinion. I have never seen, even after the most thoro operation, a single case of scirrhus of the breast with a cancerous axillary gland cured by excision."

"X-Ray Treatment of Some Forms of Cancer" was discussed by Dr. Francis H. Williams, of Boston, at the March meeting of the New York Academy of Medicine, and reported in the Medical Record. Dr. Williams used for superficial growths tubes of "low resistance" (meaning presumably low vacuum), and for deeper growths tubes of high resistance. The time of exposure was gradually increased from 5 or 10 minutes at each sitting to 20 minutes or more. The growths which he subjected to this treatment included epithelioma, rodent ulcer, carcinoma, papilloma of the larynx, spindle-cell sarcoma, keratosis, new growths looking clinically like epitheliomata of the lip, but appearing under the microscope as inflammatory tissue, etc. The growths had been on all parts of the face, on the ear, tongue, jaw, neck, larynx, arm and breast, as well as in more deeply situated parts. It seemed probable that most cases belonging to the external class could be made to disappear by means of treatment with the x-rays if treatment were commenced sufficiently early. Thus far every case of external new growth that had come under his care early was healing or improving.

Dr. Williams insisted that it was not a good plan to operate first and then use the x-rays, because after even a slight operation the x-rays experienced difficulty in favorably affecting the tissues. All of his cases of rodent ulcer were slowly improving or had healed with one exception. The exception was a case of an old woman, living at a distance, who had shown temporary improvement, but had been unable to come for regular and effective treatment. Some of his cases had been healed for more than a year, and there had only been one recurrence. This had occurred, after about six months, in an epithelioma of the lip. The recurrence yielded readily to treatment. Some cancers of the tongue that he had treated had been difficult of access, and had improved, but had eventually become worse.

Dr. William J. Morton exhibited a case of a large osteosarcoma behind the ear, nine-tenths of which had already disappeared after twenty treatments.

Dr. A. B. Johnson reported several cases of carcinomas cured by x-rays, and said that by the use of more powerful apparatus it would be possible in the future to attack the more deeply-seated new growths with a fair chance of success.

Dr. Percy Turnure presented two cases, a man of 60 cured of inoperable epithelioma, and a woman cured of erythematous lupus of the nose. His results with carcinoma had not been encouraging.

Dr. George C. Hopkins reported success in x-ray treatment of many cases of recurrent cancer.

Dr. H. G. Piffard had cured in a very short time an epithelioma of the cheek by curetting, followed by the galvanocautery, whereas the x-ray treatment, he said, would have taken two months. Nothing was said as to the cosmetic results of the cautery process.

Dr. J. Hall-Edwards, in this issue, gives an excellent report of Finsen light apparatus of improved forms. Finsen himself has come to the conclusion that sunlight is the best, and uses lamps only when sunlight is not available.

The earliest therapeutic experiments with x-rays were not accidental, as the doctor implies. They were employed by Dr. H. P. Pratt, of Chicago, for purposes of investigation, after his positive results in the destruction of bac-

teria in cultures by x-rays in 1896; and showed beyond a doubt that the x-rays have therapeutic value.

It is true that static effects often play a part in the treatment; and since the action of the x-rays is admittedly electric in character, these effects are in many cases indistinguishable. But it has been abundantly shown that x-rays will do what static charges will not do, and hence that they have a therapeutic value of their own.

Dr. Hall-Edwards prefers for therapeutic purposes a very hard tube, admitting, however, that it is the most difficult to deal with successfully. It is. The doctor will find success much easier with a lower tube. Probably the selection of the hard tube is the cause of his opinion (agreeing with Schoenberg) that no beneficial effect is produced on lupus of the nasal mucous membrane. Dr. Blackmarr presented recently before the Chicago Electro-Medical Society a case of lupus of the face and nasal septum which he had cured by using a low tube. The effects upon the nasal mucous membrane in this case were quite as marked as upon any other part.

Rules for the radiotherapist, so that he may obey the great rule non nocere, would seem to include festina lente. Stop ray exposures at the first statement of the patient that he feels a burning or prickling in the skin. Do not pave the way to disappointment by promising yourself or your patient too much for this new method. I know of no contraindication to the employment of other forms of treatment coincidently. The most favorable time to treat cancer, by the ray or otherwise, is early. At this stage the majority of cancers can probably be cured. When it has passed beyond a certain stage, cancer does not differ from tuberculosis in its probable fatal issue.

The use and value of x-rays in some forms of cancer and in certain skin diseases has now been demonstrated repeatedly. The method has its limits of usefulness, however, and charlatans have naturally exploited its reputation and exaggerated its curative properties to their own advantage and to the hurt of those members of a confiding public who have been so unwise as to place faith in their representations.—Medical Record, Editorial.

Dr. G. W. McCaskey, in the Medical Record for July 26, 1902, gives an account of his measurements of the resistance of the gastro-intestinal walls. Nothing new was found. It was not found possible to produce a peristaltic wave of the stomach.

"Raying for the Removal of Hair," is the title of a paper by Dr. Heber Robarts, published in the Electro-Therapeutist for January, 1901. The treatment advised is daily of ten minutes duration for ten days with the tube ten inches from the body. The parts not to be treated are covered by a metal mask. After the ten days, twelve treatments are given at 12 inches, then eight days of five minutes each at 14 inches. Wait two months before repeating the treatment if all the hairs are not removed.

"It will be found necessary sometimes to repeat the treatment the third time. We are trying to cause atrophy of the hair follicle which effectually destroys the papilla or root. If the radiation has been a little too effective upon the skin some irritation may be expected, and if followed by hyperemia which acts as a hindrance to the atrophying agent before it reaches the seat of action, it is well to suspend all treatment till all

symptoms have subsided. This will generally be three to five days. (This deviates from the course pursued in the cure of lupus and other skin diseases.) The face in all instances will bronze a little at about the time the hairs begin to discolor and will not disappear during the treatment. It requires some four days for this discoloration to disappear. There is no unpleasant sensation associated with this. This is ideal treatment; untoward symptoms then may follow. About the twelfth treatment the skin begins to scale and if it is continued, very slight, there will be no unpleasant sensation, but if the scaling is considerable there will be much itching. A little more intensity of current will elicit a drawn condition not unlike the sensation of collodion on the face. The next degree is a stinging, burning sensation with a decided crusty feeling. These pains are worse in the morning, intermittent during the day with almost immunity from hurting at night. The severest of these sensations last some three weeks, but require four months to entirely disappear. The milder forms fade away in a few days. Any mild antiseptic ointment with lanolin applied in the morning will hasten repair. No return to treatment should be undertaken till all the symptoms of injury have gone. The good done by the first raying is not lost and you will find much shorter time for treatment will be necessary."

Dr. E. G. Mark, of Kansas City, in the American Journal of Surgery and Gynecology for July, 1902, says:

"The electrolytic treatment of stricture (of the urethra) has practically no advocates any longer and is mentioned here simply to consign it to the graveyard of the past fads in surgery."

Doctor, go away back and sit down. How many cases of stricture have you cured by your favorite method of urethotomy? I say cured, not merely relieved. And of these how many stay cured? The truth is that, apart from dilatation, which has a limited application, there is no rational or generally successful treatment for stricture, except electrolysis, and it is coming into use just as fast as physicians are getting the necessary knowledge of electrolytic methods.

Dr. C. E. Skinner observes (Journal of Advanced Therapeutics, May, 1902), that electrical treatment is sometimes indispensible in sciatica.

The condition may be rheumatic, but is more often a neuralgia or a neuritis. There is swelling of the neuclei in the sheath of Schwann, which, by pressure upon the axis cylinder causes interruption of its function, and sometimes death at the point of pressure, followed by degeneration of the axis cylinder perifera. The condition is often caused by infection from intrapelvic neoplasms.

Treatment is to influence metabolism, viz., rest, hot air to the affected hip, salophen, and electricity.

The static current is to be employed. For recent cases the brush discharge (anode), for twenty or thirty minutes, or the sinusoidal current localized over the nerve back of the trocanter, and as far as the inflammation extends down the thigh for the same length of time, once or twice daily until the acute stage has subsided, does good service.

For the chronic cases, long, thick sparks (kathode) over the course of the nerve with the massage roller or brass-ball electrode, may be alternated with the sinusoidal current every day or two. Sparks must be employed cautiously, as they will aggravate the trouble if used before the acute stage has passed.

Dr. J. D. Gibson (Journal of Advanced Therapeutics, April, 1902), calls attention to the skepticism which, till recently, has existed in the profession in regard to the curative power of the x-ray in carcinoma and sarcoma.

It is admitted now that the x-rays do cause the disappearance of the various forms of cancer to a varying extent, but there is a lack of definiteness in diagnosis and technique. In the cases reported it is noted that in those which developed in spite of treatment low or medium vacuum tubes were used.

We need thoro, accurate and comparative analysis and investigation of the whole subject. The investigators must make definite statements of quality of tube, character of apparatus exciting the tube, and the relative amount of current employed; the detail of all particulars as to exposure, including apparatus, tube and method, distance from antikathode to person of the patient, length and frequency of exposure, as well as previous history and microscopical diagnosis of the case.

Dr. Dowling Benjamin, of Camden, read a paper on the cure of cancer by the x-rays, in which he said that, so far as could be ascertained from published cases, about twenty undoubted cases had been cured, and four others had remained over two years without relapse. Since the x-ray could pass through six inches of wood and burn the human body without burning the wood, this powerful agent must necessarily influence cancer, even if deeply situated.—Medical Record, August 2, 1902.

Dr. J. Rudis-Jicinsky has treated twenty cases of incipient tuberculosis pulmonalis with the x-ray. Nearly all of these cases showed on x-ray examination slight haziness, indicating the beginning of tuberculous infiltration, in the apices; and also the range of the excursion of the diaphragm during forced inspiration materially limited. Of the twenty, one died of tubercular intestinal complication, another committed suicide, two others did not improve, and the rest are doing comparatively well. He employed static electricity alternately with x-ray exposure in order to increase nutrition of the lung tissues. The majority of his patients improved, the bacilli disappeared from their sputum, and their night sweats ceased. They ceased to cough, felt well and were restored to usefulness.

He believes that the employment of the x-rays in earlier cases of phthisis pulmonalis is worthy of extended trial. —Journal of Advanced Therapeutics, April, 1902.

Dr. F. H. Morse read a paper on this subject at the annual meeting of the American Electro-Therapeutic Association at Buffalo, N. Y., September 26, 1901, which was reported in the Journal of Advanced Therapeutics.

He said that neuritis is often mistaken for neuralgia or rheumatism.

"The pain of subacute neuritis is aching in character, and less distinctly follows the nerve tracts than does neuralgia. Like neuralgia it is, however, liable to increase at night and have returns of violence at fixed hours, altho it is rather to be described as remittent than unremittent.

"In neuralgia the pain is not increased by pressure, or if so, only at certain points, and not over the whole nerve."

In acute neuritis stimulation does harm, as in other cases of inflammation.

In chronic conditions the object is to

improve nutrition and hasten absorption along the nerve trunks. This can be done with the sinusoidal current of either high or low frequency.

Dr. W. J. Morton said that he had treated over eighty cases of "so-called acute rheumatic neuritis" with strong static sparks (whether anode or cathode, is not stated), with a high per cent of cures.

Dr. W. B. Snow had cured ten cases of acute sciatic neuritis with the sinusoidal current. This he had found better than galvanism. In chronic neuritis, sparks were indispensible.

Dr. F. B. Bishop considered the galvanic current most beneficial in both acute and chronic neuritis. [In chronic neuritis, as in chronic inflammation generally, we find a hyperplasia of connective tissue forming adhesions which require the cathode to dissolve and remove.—Ed.] He directed the positive current downward along the sciatic nerve, using large electrodes, and 50 to 75 millimperes for half an hour.

Dr. John Gerin approved of the static spark in all cases.

Dr. T. A. Pease reported a case of chronic sciatic neuritis following a slight traumatism, cured in fifteen treatments, using the Leyden jar sparks and current.

Dr. J. D. Gibson approved of sparks in simple neuritis.

Dr. Josephine Davis reported great success in sciatica with the high tension current.

[In acute inflammation, whether of the nerves or other organs, the anode by constriction of the arterioles gives relief, the kathode intensifies the trouble. In subacute conditions the sinusoidal current accelerates metabolism, and frequently cures. In chronic inflammations the kathode increases the blood supply and dissolves or causes the absorption of hyperplastic connective tissue, and with increased nutrition completes the cure. The static breeze is tonic in itself, and is to be used in acute inflammations. Sparks are irritating, and are valuable when kathode treatment is indicated. These facts explain the apparently contradictory results obtained in the various stages of neuritis. —Editor.]

The Diagnosis of Intra-Thoraic Tumors by the Roentgen Rays.

J. Magee Finny (British Medical Journal, March 15, 1902) says that in two cases of aneurism and one of malignant disease, the x-rays were a help more or less in removing doubts and in explaining anomalous symptoms, while in one it was the only means he had of detecting an aneurism of the thoracic aorta.

Too Weak to Take Electricity.

Dr. F. B. Bishop (Jour. Adv. Therapeutics, July, 1902) says that the idea that a person is too nervous to take electricity is too ridiculous to discuss. He relates the case of a Catholic divine who, having wrenched his hip by a fall while suffering from rheumatism suffered greatly from pain and dyspnoea. The heart became very feeble with edema of the extremities. The brain was so poorly supplied with blood that he would doze while trying to carry on a conversation.

In cases of this character a mild galvanic negative current is applied to the cervical ganglia on each side and the positive pole to the back of the neck, three times weekly.

Electricity in Synovitis.

Dr. J. G. Davis reports in the Journal of Advanced Therapeutics for August, a case in a man sixty-five years old successfully treated. The patient was a stone mason. His left knee was badly swollen and very much inflamed. The foot was put on a plate attached to the negative pole in hot water saturated with bicarbonate of soda and the massage roller, wet with the same solution as hot as could be borne, attached to the positive pole, the current being from ten cells. After five minutes of this treatment the current was reversed for five minutes. The treatment irritated the skin, which was treated with zinc ointment and the knee swathed in flannel. The treatment promptly relieved the pain and reduced the swelling. The number of cells were increased to thirty-two as the extreme sensitiveness abated, and the time of application reduced to five minutes over different points. The case was extremely chronic and drugs had proved utterly unavailable. The treatment was repeated every other day for two weeks.

(The sinusoidal current gives even better results in such cases.—Editor.)

Lupus Vulgaris and Its More Modern Treatment.

Dr. A. C. Geyser (Jour. Adv. Therapeutics, July, 1902) recommends the brush discharge from negative wooden electrodes combined with the x-rays in the treatment of this disease. When it is desirable to set up a strong counter-irritating effect, the x-ray is used until a condition bordering on an idiopathic dermatitis is induced. Other cases are treated with the brush discharge from a wooden electrode of soft maple. In other cases where there are certain areas where x-ray dermatitis is necessary to a cure, the brush discharge is combined with the former.

Case 1. Seven years standing. Three x-ray exposures at a distance of six inches from the tube, four-inch spark-gap, healthy tissue protected, three times a week with x-rays, and nine brush-discharge treatments. Slight dermatitis. Has remained cured one year.

Case 2. Seven years standing. X-ray ten minutes, four inches from tube. After fourth exposure slight dermatitis, and brush discharge substituted three times a week. Cured in five months.

Case 3. Disease had spread from the nose to the lips, cheeks and inside of the nose and mouth, and affected one eye. Nourished through a glass tube for two years. She had thirty-four x-ray exposures and thirty brush-discharge applications. Cured.

Case 4. Ten years' standing. Fourteen x-ray exposures caused marked dermatitis; he then received twenty brush-discharge treatments. Cured.

Chronic Glossitis.

Dr. G. B. Massey reports (Jour. Adv. Therapeutics, July, 1902) five cases of this disease successfully treated with solutions of silver nitrate and chromic acid under the influence of the electric current. He includes under the name leucoma, leucoplakia, glossitis, dessicans, ichthyosis, tylosis or eczema and keratosis. The tongue is painted with a fifteen per cent solution of chromic acid and the metallic kathode rubbed over the painted areas for ten or fifteen minutes, and has a cauterizing effect on the diseased area.

Ozone and Static Electricity in Tuberculosis.

Dr. H. S. Boardman (Jour. Adv. Therapeutics, August, 1902) reports a case of tuberculosis of the right lung successfully treated. The patient was a man aged forty, of slight build, whose mother died of cancer. After an attack of grippe he had a hacking cough, loss of appetite, loss of strength and of sixteen pounds in weight, with night sweats and great depression of spirits. There was marked dullness over the third lobe of the right lung, with great tenderness over that region, and lack of expansive power. He expectorated large quantities of a thick, heavy mucus of a yellowish-green color.

Inhalations of ozone caused quite severe paroxysms of coughing, but were continued. Static negative breeze to the head with crown electrode for ten minutes, brush-discharge to the surface for two minutes.

There was steady improvement and a complete cure after six months time and sixty-five treatments.

Sinusoidal Current.

It is an alternating current similar to that obtained from a faradic coil, being much smoother and much less liable to produce muscular contraction.

The current is obtained from the static machine by connecting the patient in the circuit from the outer coating of a pair of Leyden jars, when the balls of the discharging rods are one-fourth of an inch apart.

The effect of this current is to accelerate metabolism. It is extremely useful in chronic inflammations and non-malignant tumor formations. Local inflammation due to infection may also be frequently cured by this current

The Diagnosis of Renal Calculus.

Attention has recently been called to the difficulty of making accurate diagnosis of renal calculus by a clinical lecture delivered by Sir William Bennett. (Philadelphia Medical Journal, February 22, 1902). He presents the history of several cases showing the great variety of symptoms which renal calculus will produce. One of the cases described was that of a patient who presented the typical symptoms of renal calculus, and yet when the kidney was exposed and opened no calculus could be found. Bennett does not seem to look with great confidence upon skiagraphs as an aid to diagnosis, in this respect differing from a number of authorities. He claims that the negative result of the x-ray examination is "practically valueless." Leonard, (Jour. A. M. A. November 30, 1901) makes the most positive claim for the value of negative as well as positive results with the x-ray in cases of suspected renal and ureteral stone, and asserts that incision into the kidney for suspected calculus is only justified by the previous detection of the stone by the Röntgen method. Jonathan Hutchinson, Jr., (Brit. Med. Jour., October, 1901) also expresses great confidence in the x-ray method, excepting in cases in which the patient is very fat and the stone very small. Bevan (Annals of Surgery, March, 1901) says that the x-ray has revolutionized the diagnosis of renal stone and his experience regarding the value of this method corresponds to that of Leonard, who probably is its strongest advocate. He presents a skiagraph which shows a stone in the kidney which failed to be located during an exploratory incision of the kidney. He also tells us of cases in which multiple stones have been demonstrated by the x-ray and yet the

surgeon would probably have been contented with the removal of the largest of these. Three skiagraphs which he presents taken a year apart are particularly interesting because they show the gradual growth of a kidney stone. It would certainly seem that no exploratory operation should be done for renal calculus unless a most careful skiagraph had been made. It is probably true beyond doubt that cases have been operated upon and stones removed which the x-ray failed to locate, but it must be remembered that these x-ray pictures should be taken with the most approved apparatus and by an expert operator. In the absence of these, however, the surgeon must, of course, largely rest upon the clinical aspect of the case for his guidance.—The Philadelphia Medical Journal.

Tanning as a Preventive of the X-Ray Burn.

Dr. W. J. Morton (Medical Record, May 24, 1902) says that with care, and by shifting the tube often, a bright erythema, the effects of the rays, can be converted into a brown and often, in brunettes, into a blackish "tan." By pursuing this plan he does not find it necessary to discontinue treatments on account of a mild x-ray dermatitis. He does not advise the "tanning" process to be carried out without due caution, but he affirms that in cases of internal cancer we must continue in spite of erythema if we would succeed. Following this general advice, certain cases of exterior and interior cancer, where the same area of skin is not necessarily subjected to radiation, may be x-rayed more frequently, and even daily, without danger

It has long been known that the oscillatory discharge of a condenser produced a very brilliant spark which was likely to have strong actinic qualities. Recently, Miller suggested that such a spark might be of service in the production of the ultraviolet rays for the treatment of disease according to Finsen's method. Turner has experimented with comparisons of the ultraviolet radiation of the arc lamp and that of a spark. His experiments led him to conclude that the spark-gap radiation is a more powerful ultraviolet than that from an arc light, and also that rock salt forms the best compressing medium. A man, aged 55 years, who had suffered from a rodent ulcer on the right side of his nose for eight years, had been treated by the x-rays with slow but steady improvement. The x-ray treatment was replaced by exposures to ultraviolet light three times a week from 2½ to 5 minutes at a sitting. Marked improvement was observed three days after the first exposure. After five exposures the only trace of the disease that remained was some light scales toward the upper margin of what had been the ulcer.—Modern Medical Science.

The Cure of Hemorrhoids by Galvanism.

Dr. C. A. Brice (Southern Clinic, April, 1902) recommends galvanism in the treatment of internal hemorrhoids. The rectum should be cleansed with an ample injection of warm water, and the tumors strained down or the sphincter stretched and the tumors brot down. Use the positive current within the pile tumors by means of needles of platinum or gold, one to four being thrust into the tumor at its base, a current of five ma. being employed, and the needles held there till the tumor changes color and becomes hard. The bowels are kept quiet for twenty-four hours and then moved by a warm water injection.

To Reduce Too High a Vacuum in an X-Ray Tube.

Baking the tube is ordinarily effective, but it takes too much time, while with the Müller tube this is accomplished in a few seconds or minutes. This tube is made with an auxiliary tube connecting with the vacuum, in which is placed a small coil of palladium wire. When the vacuum is to be reduced the kathode is connected with the electrode opposite the palladium wire, and the usual current turned on. The kathode stream shoots across the space in the auxiliary tube, striking upon the wire and heating it. This wire when heated gives out gas, which reduces the vacuum.

Investigation is needed to devise some physical and reliable method for measuring the quality and intensity of x-rays. Until this can be done a great deal of confusion is unavoidable. Many x-ray workers imagine that a poorly illuminated tube is the same thing as a low tube, because the hand gives a black shadow in each case.

Sterility.—The following case reported by G. M. Blech (Philadelphia Med. Jour., December 7, 1901): His patient was a man of thirty-two, in fair general health, of good habits, with no history of syphilis, but an indefinite one of gonorrhea many years before. Married eleven years, no offspring. A specimen of semen was secured immediately after intercourse and examined. Spermatozoa were found, well developed, but lifeless. Tonics and hydropathic measures were used for three months, and then an examination disclosed no change. The electric current was then resorted to, the treatment consisting of negative galvanic applications to the prostatic urethra, five to twelve milliamperes. Twelve treatments were given (two per week), each sitting lasting from five to eight minutes. An examination after this showed numerous living spermatozoa. Pregnancy has since then been determined in the wife.

The temperature of the electrical incandescent lamp has been determined by the French physicist Janet, of the Paris Academy of Sciences. To preserve the heat radiated from the carbon filament of a lamp is a matter of great difficulty, since the filament is separated from the atmosphere by a vacuum. Janet has determined from investigations made with four different lamps that the filaments attain a temperature varying from 1,610 to 1,720 degrees C.—Electricity.

According to the Morning Post, a Russian specialist has decided that electric light has less damaging effect on the eyes than other artificial light, a conclusion which ought to be modified one would suppose by the consideration of the light's intensity. His conclusion was based on the number of times that a human subject involuntarily closed the lids of his eyes when light of various kinds was being shed on them. The lids closed nearly seven times a minute with candle light; a little less than twice a a minute with gaslight; a little more than twice a minute with sunlight; and less than twice a minute with electric light.—Electricity.

The Treatment of Callous Sinuses With X-Rays.

Dr. D. Barry (British Medical Journal) found that a sinus of the abdominal wall, which had resisted all other treatment, healed readily after exposure to x-rays.

Roentgen Ray Society of America.

The next meeting of the Roentgen Ray Society of America will be held in Chicago, December 10th and 11th, and promises to be the best meeting in the history of the Society. A very fine program, which will be announced later, has been secured, and on it are several of the leading men of Medicine and Science. We will have a manufacturers' exhibit, showing the latest improvements and most approved forms of apparatus. The local preparations are in the hands of a most excellent Committee, as follows:

DR. RALPH R. CAMPBELL, *Chairman.*
414 Marquette Bldg., Chicago.

DR. JOHN B. MURPHY,
Reliance Bldg., Chicago.

DR. LOUIS E. SCHMIDT,
424 North State Street Chicago.

DR. M. L. HARRIS,
100 State Street, Chicago.

DR. W. L. BAUM,
103 State Street, Chicago.

DR. H. G. ANTHONY,
465 Dearborn Ave., Chicago.

DR. W. A. PUSEY,
Columbus Memorial Bldg., Chicago.

For any particulars or information, write to either the Executive Committee or the Committee on Arrangements.

WESTON A. PRICE, D. D. S.
Chr. Ex. Com.

The chairman of the Local Committee desires us to announce that all persons wishing to make an exhibit, should send their application in as soon as possible, so that the necessary floor space can be alioted them.

Chicago Electro-Medical Society.

The next meeting of this Society will be held on Tuesday evening, September 30, 1902, in room 902, Masonic Temple. Interesting papers will be presented by Prof. C. H. Treadwell and others.

A cordial invitation is extended to all physicians to be present.

PUBLIC WATER SUPPLIES.

Rudyard Kipling, because of ancient tradition, in "Kim" sends his lama all over India in search of "The River of the Arrow; whoso bathes in it washes away all taint and speckle of sin." Needless to say, the river was never found. Had the search been instigated in St. Louis, there probably would have been great hope of success.

There is a tradition, equally true, that the Mississippi River is the best and healthiest water on earth; it must be true, because it is a tradition that memory of man runneth not to the contrary. It must be pure and wholesome, because at least one-fifth of the population of America, and part of Canada, are throwing all human waste, the waste of factories, slaughter houses, and the refuse of shops into it. A trip by boat from St. Louis, north, would disclose enough carcasses of dead animals lying in the water, or close to it, ready to be washed in on a raise, to satisfy the most fastidious. Were it not for the clay, sand and silt in the water, it would be impossible for people to live in the Mississippi Valley. Bacteriological and chemical analyses, made both by St. Louis officials and the Drainage Trustees, show that the water is simply *rotten*, and that the pollution is daily increasing.

Can it be possible that men and women made in the image of God, who declared "Cleanliness next to godliness," (in spite of chemical and bacteriological analyses and the physical evidences of pollution) still hold to such a tradition and gulp this delicious morsel of refined human waste with the same degree of credence as the mothers who cast their babes into the Ganges River to be de-

voured by the alligators, or drowned, because it pleased the gods? Savages who lived on the shores, dug wells or pools close to the river to obtain water to drink. Are we worse than they? Has tradition deadened our taste, smell and sense of decency? Are we blind idolators? We must be, judging from our actions. We must be a senseless race, because our fathers and forefathers have drunk and bathed in this water.

There is no special virtue in the Mississippi River, outside of its size and filth. It is the largest sewer in the world. It carries more sewerage, debris and rubbish than any sewer in America, and St. Louis has the filthiest water supplied to any American city, as will be seen by an examination of the evidence prepared in the Drainage Canal Suit.

Physicians are the custodians, at least *de jura*, of the public health and are directly responsible for the present condition.

Water is the principal element of food. 60 per cent of the body weight is water; nearly 70 per cent of the blood corpuscles is water; of the serum of the blood 90 per cent is water. Water is the main constituent of the blood. It is the principal and most important food, and may be regarded as the principal element of life. The importance of a pure water supply is, therefore, apparent.

The absolute proof of the hygienic quality of water supply is still beyond the reach of our most modern methods of research.

Sir George Buchanan, chief medical officer of London, England, one of the greatest students of hygiene in the world, said: "It is a well-known fact that population could often continue drinking highly polluted water without apparent harmful effect, but ultimately it took upon itself morbific qualities which caused disease and death." He gave as his opinion that he did not think it was possible, either by chemical, microscopical or bacteriological processes, to say when a water was or was not injurious. "The only way of arriving at a solution of the question was by inspecting the sources of supply, and if they were polluted the only remedies were either to boil the water or else leave it alone."

Bacteriologists deal in matter found only in suspension; dangerous substances may, and very often do exist, in solution, and their methods of search would not disclose the fact.

Ptomains occur in water in solution, and the ordinary chemical water analysis will not reveal them. Professor E. Ray Lankester says, "That it is very difficult, if not altogether impossible, to detect ptomains or toxic substances in water by any known chemical process."

Mr. Chesbrough, the late celebrated hydraulic engineer said: "The only way to purify water is not to let it get dirty." He tersely states a living truth and safe rule to follow when applied to public water supplies.

It is possible to purify water to a greater or less degree by the application of aluminium hydrate prepared electrolytically from metallic aluminium, as was shown by the Harris Magneto-electric system at Louisville. No lime in the river water is required with this process, and there is no increase in the corroding and incrusting constituents of the filtered water, which is a very important factor in filtration. The available data shows that it would be costly to an excessive degree if applied to water supplies of large cities. There is, however, a wide field for investigation along this line.

Sand filtration was adopted in 1829 in England. It has done much to alleviate impurities from water, but years of experience has demonstrated that filtration is not germ proof, and that all poisons in a liquid form pass freely through the filters.

Mechanical or chemical filtration has been practiced since 1831, and from that day to this has been frowned down by the ablest scientists of the world, because the chemicals applied leave the water after filtration in a worse state than before, and mechanical filtration was practically dead until Yankee ingenuity and corporate capital, taking advantage of the financial inability of cities to obtain pure water (owing to their debt limit) have created quite a stir in municipal affairs, over improved methods of applying chemicals in treating water. When a plant has been thrown out as a failure, an engineer of the company has but to read a paper before the Society of Engineers to keep the matter alive.

Samuel Rideal, an eminent chemist and bacteriologist said: "Neither method of filtration can be regarded as a satisfactory means for preventing the appearance of pathogenic germs in water. No matter how small the fraction of the organism left, there might be among them some which might be injurious to health. Therefore, although either sand filtration or mechanical filtration is a very good line of defense, it is not the only line of defense upon which one should rely. The concenses of opinion of the scientific men of the world, including civil and hydraulic engineers, is that it is *better to obtain a water supply from a source that is not polluted, than to obtain one from a source known to be polluted and attempt to filter it.* It is by far wiser to spend your money in keeping pollution out of water than it is in trying to remove it.

The main point is that disease germs shall not be present in our drinking water. If they can be kept out in the first place, that is the thing to do.

Pumping water for domestic uses from a source known to be polluted by sewage or otherwise, should be severely condemned. To shut ones eyes to the fact that polluted water is dangerous to health is little less than a crime.

Every city that continues to supply a tainted water without earnest and intelligent efforts at abatement, is guilty of a barbarism not tolerable in this age of enlightenment and progress.

Shall we as medical men recognize the evil and address ourselves to the remedy, or shall we continue to see thousands of our best citizens pass away yearly, when we know the cause and have the remedy at hand.

HEBER ROBARTS, M. D.

Electricity in Dermatology.

In an editorial (Jour. Adv. Therapeutics, July, 1902) Dr. W. B. Snow says that the x-ray is unlike any other remedy in the treatment of skin diseases. Its action is so little understood that it is only possible to study it clinically. It causes contraction of cell protoplasm and diminishes local congestion. While prolonged exposures may cause dermatitis and sloughing, regulated exposures cause various skin affections to recede and disappear, either by absorption or sloughing, without injury to surrounding healthy tissue, to be followed by healthy granulation and healing with a minimum of scarring. It causes alopecia and atrophy of the skin, and induces inactivity of the sweat glands when repeated relatively short exposures are made.

The high potential modalities of the static machine and high potential coil are invaluable to the dermatologist. The general effect on metabolism of the static current is to increase, when subnormal, the functional activity of all the organs of secretion and excretion.

FROM ETHER TO THE PHYSIOLGICAL UNIT.

Dr. George Adam of San Francisco, in recent numbers of the Journal of Advanced Therapeutics, relieves himself of various ideas under this title. His point of view is explained in a foot note as follows:

"The purpose of this article is the consideration of certain physiological phenomena, and it will not enter into the details of conclusions arrived at on electric, chemic, nor physical subjects. The author, in following his hypothesis, has found that the laws of attraction and repulsion, that of gravitation, and those concerning other properties of matter, have been incorrectly stated, and that conclusions from Avogodro's law, those concerning the origin of light and heat, and their relationship to electricity, have been based upon misconceptions of the fundamental conditions of matter."

The mathematician, DeMorgan, said that after being pestered with circle squarers, perpetual motion cranks and others who had solved all the problems of the universe, he adopted one unvarying plan of meeting them. "You tell me," he would say, "that all scientists are in darkness, out of which you alone can lead them. Very well. It is recorded of Moses that he was learned in all the wisdom of the Egyptians before he led his people out. Sit down here and show me that you understand the folly of the scientists, and I will then be ready to accept your leadership out of my Egyptian darkness; otherwise, I wish you good morning."

Not feeling sure of my ability to reach from ether to the physiological unit, I am inclined to use DeMorgan's test upon this paper. I read: "Electricity is the Chemistry of Ether;" evidently electricity is then a branch of science. Later this definition is entirely disregarded, for Dr. Adam says: "Ether is not a conductor of electricity, because the attractions and repulsions within its molecule are fully satisfied, and the free atoms of ether—electricity—do not adhere to the surface of the ether molecule." Now Dr. Adam is at liberty to formulate as many hypotheses as he pleases, but scientific men aim at consistency in their hypotheses, and they try to use words as they are commonly understood by other scientists. Crude and inconsistent statements of fundamental assumptions, which characterize the opening paragrafs of this paper, are not encouraging to the reader. Statement after state ment is made, some of which are known facts, and others pure hypotheses, without any attempt at distinction for the benefit of the non-expert reader. Discussing molecular structure, he skips over all the brilliant discoveries of the last half century in chemistry, and informs us that the molecule "has the property of assuming differential poles, and that within its construction there are no units nor groups of units—atoms—which can be characterized as a molecule or sub-molecule,"—a statement which is contradicted by hundreds of thousands of chemical facts. The physiologic unit, he says, is a molecule of this unknown type, and he proceeds to explain physiologic processes by further hypotheses regarding changes in the shapes and relations of his hypothetic molecule.

Dr. Adam's chief trouble arises from the fact that he attempts a chemical explanation of phenomena without the necessary knowledge of chemistry and physics, serious blunders appearing even in a simple chemical equation. Whenever he deals with facts with which he is sufficiently familiar, his treatment is keen and clear.

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Secretary of The American Electro-Therapeutic Association.

THE AMERICAN X-RAY JOURNAL.

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

VOL. XI. ST. LOUIS AND CHICAGO, OCTOBER, 1902. No. 4.

PUBLISHER'S ANNOUNCEMENT.

THE AMERICAN X-RAY JOURNAL will devote its columns to the education of the medical profession in X-Ray and Electro-Therapeutical Practice.

This includes (a) X-Ray Diagnosis, both medical and surgical, the methods of fluoroscopic and photographic examination, of locating fractures and dislocations, renal and hepatic calculi, aneurisms, abnormal conditions of the heart, tumors, tubercular diseases, malformations, etc.

(b) X-Ray Therapy, treatment of cancer, tuberculosis, diseases of the skin, etc., etc.

(c) Electro-Therapy of acute and chronic diseases as follows: Mental and nervous; diseases of the heart, lungs, eye, ear, nose and throat; gynecology, obstetrics, genito-urinary diseases, diseases of children; skin, liver, kidney, rectal and intestinal disorders.

(d) Dental diagnosis and treatment.

X-Ray and Electro-Physics, insofar as they directly concern the physician and surgeon, will receive their full share of attention.

As far as praticable, each number of the Journal will contain articles in each of the following departments:

1. Scientific and original articles for advanced workers.

2. Clinical reports of x-ray therapy and electro-therapy. Every physician, no matter what school he belongs to, is invited to send for publication reports of his cases treated with the x-ray or electricity, not exceeding two hundred words. State exactly what you did, how you did it, and the results, and the Journal will be glad to give you the space.

3. Editorial News and Notes, giving the latest news in x-ray and electro-therapeutics from all parts of the world.

4. Queries answered by well-known specialists.

5. Lessons for Beginners, a complete course, consisting of 24 lessons, under the auspices of The Chicago College of X-Ray and Electro-Therapeutics, on the principles and practice of x-ray and electro-therapeutics. No physician can afford to miss this course. It is worth $100 to any practitioner.

We will expose fraud and charlatanism wherever we find it, and will exercise the utmost care to see that everything that enters the pages of the Journal is thoroly reliable. Truth is what we seek and truth we welcome from every source, giving credit where credit is due, without fear or favor.

The Journal will be enlarged as rapidly as necessary to meet all requirements. The subscription price will remain the same as heretofore, $3.00 per year in the United States, Canada and Mexico; $4 in foreign countries. Single copies, 50 cents.

SPECIAL NOTICE.

We are in receipt of numerous enquiries asking us to recommend physicians in various parts, who are competent to use electricity and the x-ray.

We propose to reserve space in our advertising pages for cards of those we know to be competent. For conditions and terms address the publishers.

The Treatment of Urethral Stricture by Electrolysis.

BY ROBERT NEWMAN, M. D.

Ex-President American Electro-Therapeutic Association, Consulting Physician to the Home at Yonkers, New York; Consulting Surgeon to Hackensack Hospital, etc.

The treatment described below has been successfully used by me in more than two thousand cases during the last thirty-three years, and I have not lost a single case by death from this treatment. Many of these patients have been kept under observation for years and re-examined from time to time, and in no case has a relapse been found. The treatment is painless, relief is immediate, and the patient is not prevented from attending to his ordinary business.

BOUGIE A BOULE.

Strictures are of two types: (1) Spasmodic, and (2) Organic. Organic stricture may consist of slight pathological changes in the mucous lining only, for which gentle dilatation is the ideal treatment. But in my experience most cases of organic stricture were found to be infiltrations of submucous tissues, spread in a circle, deep-seated more or less thruout all tissues except the foreskin. This causes fibrous formations and cicatrices, which infringe slowly but steadily on the caliber of the urethra from the outside, and sometimes form even abscesses. Such strictures can not be expected to yield to the different surgical means, and the infiltrated tissue can only be cured by absorption.

The diagnosis is most important. It must be established without any doubt that it is an organic stricture of the urethra, to the exclusion of a spasm of the bladder or any other disease of the bladder, prostate or urethra. In any other acute disease, inflammation, hemorrhage, or discharge, electrolysis is contra-indicated. The topography of the urethra should first be well ascertained, the strictures measured, and a plan for the operation made out accordingly, with a full knowledge of what it is intended to accomplish. The posture which the patient assumes during the operation is immaterial. Anesthetics are not used, as no pain should be caused, and the patient ought to be conscious so that he can express his sensations.

The exploration of the urethra is made with a bougie a boule, of whalebone, of the proper size, with an olive-shaped head and slender neck.

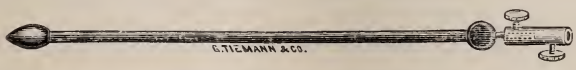
Four sets of electrodes have been devised by the writer, namely:

1. *The Egg-Shaped Set.*—These are the regular electrodes for all ordinary cases, have a short curve, an egg-shaped metallic bulb at the working end, while at the upper end there is a round wire rod for the binding screw of the negative pole of the battery. These are the only points not insulated and act as conductors for these extremities. The rest of the electrode must be well insulated, smooth, and without inequalities. A conical bulb is objectionable in most cases, as we depend on the electrolytic power of absorption, not on force. The length of the bulb is proportioned to the size of the electrode;

THE EGG-SHAPED ELECTRODE.

thus, for No. 11 French the bulb is 3-16 of an inch, while for No. 21 it is 3-8 of an inch. The set consists of Nos. 11, 14; 17, 18, 20, 21, 23, 25, 28 of the French scale.

2. *The Acorn Set.*—These are for use in the first six inches of the urethra in certain cases, and consist of Nos. 15, 17,



THE ACORN ELECTRODE.

20, 22, 25, 27, French. They are without a curve, short, and the bulb is acorn-shaped. Sometimes it is desirable to gain ground by entering the contraction first with the point of the electrode, in order to follow easier with the larger part of the acorn; here this form will do good work. The action of the electrolysis depends on the largest diameter of the bulb in these cases, and does most service on the withdrawal of the electrode when the operator feels best how much work should be done. They are also used when the stricture is near the meatus. They are six inches long, and thereby avoid the temptation to pass the instrument deeper into the prostatic part of the urethra when such introduction is not needed.

THE TUNNEL ELECTRODE.

3. *The Tunneled Electrode.*—These are in Nos. 9, 11, 14, 17, 20, 21, French. They are very important for bad, tortuous strictures, and are to be used only by the expert operator. The curve is shorter, and the egg-shaped bulb tunneled so that it may be introduced over a filiform guide. When the strictures are tortuous these electrodes are safer, and false passages are impossible.

4. *The Combination Electrode.*—This is a tunneled electrode, combined with a catheter. When a very tight stricture is complicated with retention of urine, the indications are to remove the obstruction and draw off the urine with one instrument, as the parts are too sensitive to tolerate the introduction of two instruments in succession. The patient may also be benefited by washing out the bladder, all of which can be done with *one* introduction of this instrument; but it is advisable to leave a small quantity of pure water in the bladder, so that this organ can regain its muscular action.

The bulbs of all electrodes are just as large as the size they represent; not conical at the end, as the sounds are which are usually sold. This makes a difference of from six to eight numbers between Newman electrodes and the shop instruments, in which the number is expressed by the size at the shaft.

THE COMBINATION ELECTRODE.

For ordinary strictures, the size of the bougie selected should be two or three numbers (French) larger than the stricture. Since my method has become popular, some instrument makers have sold an inferior and faulty article by the thousand, and very cheap. Some have even manu-

factured at random instruments which they sell as Newman's electrodes, for which I am not responsible, and deny most emphatically the parentage. I have seen many defective instruments with wnich nobody could perform the operation correctly. Electrodes in which the metal bulb is screwed to the stem are always dangerous, and should never be manufactured.

Any good galvanic battery of twenty or more cells can be used for the work. A milliamperemeter is necessary; whether a rheostat or controller alters the action of the electrolysis is a mooted question. *

Examine the battery carefully, test the poles, and be sure that everything is in working order. Connect the electrode with the binding post of the negative pole of the battery, as only the negative electrode (kathode) must be used to the stricture, which causes a chemical galvanic absorption, attracting the alkalies and the hydrogen. The electrode must be lubricated with glycerine and introduced into the urethra until the bulb is arrested by the stricture. A pad electrode wet with warm (salty) water and connected with the positive pole of the battery completes the electric circuit. This positive electrode (anode) is best held by the patient firmly in the palm of his hand, but may be pressed against any other part of the cutaneous surface of the body. While both poles are held in this manner the galvanic current is slowly and gradually increased, one cell at a time, until the patient feels a warm and slightly pricking sensation. The strength of the current must be from two to five milliamperes. The writer uses not more than five milliamperes, but under some circumstances accomplishes all he wants with two or two and one-half milliamperes.

At this time comes the most important part of the operation, the guiding of the electrode, which must be held steady but gently against the stricture. Under no circumstance must pressure be used. The absorption must take place entirely by electrolysis. The stricture yields, is enlarged, the electrode slowly advances, passes the obstruction, and sometimes will fairly jump through the stricture. If there are more strictures than one, the electrode should be guided through each in the same way until it enters the bladder. Then slowly in the same manner withdraw the electrode, pause a little at each stricture, for another dose of absorption, till the first stricture—nearest the meatus—has been repassed, when the current is again to be reduced, slowly, cell by cell, to zero, and not until then is the electrode to be removed. During the whole operation the electrode must be held against the obstruction, all pressure or force being avoided. Any dilatation by pressure or any force is a mistake; the bougie will take care of itself, doing its work by the electrolytic action of the current. A seance may last from five to twenty minutes. The average is about ten minutes. Then the urethra should be left alone, and under no circumstances a sound used.

An antiseptic irrigation of the urethra may be used before the operation—in fact, some patients expect it. The seance should be repeated at intervals of one week, each time using an electrode two or three numbers larger than the last one used. On the average the cure of a stricture takes about two months.

As some physicians who are unfamiliar with the technique of electrolytic operations have reported failures in their attempts to relieve stricture by this method, I call attention to the essential conditions of success.

1. Correct diagnosis. Spasmodic stric-

* I do not like to use a rheostat, which converts the whole number of cells into *one* cell, thereby making a different action of electrolysis. This is a mooted questio, and not according to rules of the general electrician nor ohms law, which I admit However, from experience and results, I have come to the conclusion that the e'ectrolysis is harsh and different with a rheostat than without it—using only full cells—augmenting by one cell only at the time, beginning at zero, increasing and decreasing by degrees of *one* cell only.

To prove this, elaborate experiments in a laboratory would be necessary. I can speak only from practical experience.

ture and all acute inflammatory conditions of the urethra are made worse by this treatment.

2. Correct current strength. Less than two milliamperes will rarely be found effective. More than five or six milliamperes may cauterize; and so re-induce the condition it is sought to cure.

3. Use of the kathode or negative electrode in the urethra. The anode would make matters worse than before.

4. Electrodes of the proper size, shape and material.

5. Proper duration and interval of seances; five to twenty minutes about once a week.

6. Avoidance of force and all forms of irritation, whether mechanical, electrical, or chemical.

Numberless reports of successful treatment by this method have been given. Failures are due to non-observance of these rules. All organic strictures are amenable to this treatment.

It must and will succeed in proper hands in every case that is intelligently and judiciously undertaken. The operation itself needs a clear head, a steady hand, fingers which both see and feel, patience and combined expertness of the electro-therapeutic and genito-urinary surgeon.

For the positive electrode use carbon or zinc, covered with absorbent cotton saturated with water, or a warm solution of common salt: * if preferred, and apply firmly to the cutaneous surface of the patient's hand, thigh, or abdomen.

The negative electrodes are firm sounds, insulated with a mass of hard-baked rubber. The extremity is a bulb, which is the acting part in contact with the stricture. Four varieties are now in use, as described above. The curve of the electrode should be short; large curves are mistakes. The electrodes must not be lubricated with any non-conducting substance.

THE ADVANTAGES OF ELECTROLYSIS.

1. Electrolysis is applicable to all organic strictures in any part of the urethra.

2. Electrolysis will pass and enlarge any stricture, when other instruments or the skill of the surgeon fails.

3. It causes no pain or inconvenience.

4. It is devoid of danger.

5. It is not followed by hemorrhage, fever, or any other unpleasant consequences.

6. It relieves at once.

7. The patient is not prevented from attending his daily work or business, and can earn his living while under treatment, without restraint.

8. No relapse takes place.

The spasmodic stricture, which is described by writers in most of the text-books, is an unfortunate misnomer.

A stricture is a permanent pathological condition, by which the caliber is smaller than in the normal state. The name ought to be descriptive of the condition, and therefore, the expression "spasmodic" stricture misleads most medical men in conception, diagnosis and treatment. A spasm is a temporary action, dependent on other and entirely different causes and should not be called a stricture. In reality this is a vesical tenesmus, which in most cases is dependent on the muscular contraction of the bladder, which at different times may be more or less, according to the causative actions. Hence the definition of an organic stricture should be "a permanent narrowing of the caliber of the normal urethra, which either exists in the urethra itself, or in the tissues surrounding the canal." Violent spasm may be caused by complications, or some other primary causes, which are then simultaneous with the organic stricture, in which case each disturbance needs a different treatment. Therefore it might be, that the organic

* For the indifferent positive pole I use a pad electrode moistened with hot water. I do *not* use salt because it increases the current (in amperage) to such a degree, that I cannot control it, thereby acting too much in decomposition, and cauterizing instead of absorbing. The salt also oxidizes the pad and its base of metal or carbon. As I use not more than five milliamperes, I can control the current better without the use of salt.

stricture of the urethra must be treated by the galvanic current, while the spasms of the bladder need a Faradic application.

Treatment.—The question naturally arises, what different treatment must be pursued in the two different conditions. A correct diagnosis is of first importance, and next the causes of the disease must be determined. Then the following rule will guide the operator:

An organic stricture must be treated as advised and described in this article. Electrolysis, which can only be produced with a galvanic battery, will cure that stricture by absorption; but the same procedure will aggravate any spasmodic action. The practical fact is, that the electrode with a galvanic current is impassable through a temporary spasm.

The spasmodic stricture is passable and must be cured by a Faradic (alternating) current, which is more effective if such Faradic current is applied with a high tension apparatus, which, of course, is a Faradic current. The high tension machine of the Jerome Kidder Mfg. Co. has served the writer best. The technique and electrodes are the same as used for an organic stricture. Medical measures may be used in addition as indicated by symptoms.

Never forget the rule:

Use the galvanic current for the organic stricture. Use the Faradic (alternating) current for spasm, or as it is called, the spasmodic stricture.

101 W. 80TH STREET, NEW YORK.

Electricity in Bright's Disease.—Rockwell finds that electricity is of advantage in Bright's disease, though it can not be shown that it affects the waxy or cirrhotic kidneys. Its action on simple hyperemia, acute inflammatory affections and many passive congestions is especially mentioned. The most useful currents are the high tension faradic current and the so-called static wave current.

Melano Sarcoma of the Eye Treated With the X-Ray.

BY J. E. HARPER, M. D.

(Read before the Chicago Electro-Medical Society at its September meeting, 1902.)

Mrs. M. Hendricks, married, aged 23 years, was admitted to the Illinois Charitable Eye and Ear Infirmary Dec. 2, 1901. Examination revealed a dark colored growth on the sclera of the right eye. The growth was about 5 mm. in diameter and extended outward from the limbus of the cornea, the lower edge reaching below the horizontal meridian. The patient stated that she first noticed, about a year before, a small dark spot which steadily grew until it had reached its present size. She had experienced some pain in this portion of the eye from time to time, but the pain was never severe. The cornea, iris and ciliary body were apparently not involved. Vision was normal.

Dr. W. H. Peck removed a piece of the growth and this was examined microscopically by Drs. Wilder and Brown of the infirmary staff. A positive diagnosis of melano sarcoma was made and after consultation enucleation was advised. A few days later the case was shown to the members of the Chicago Ophthalmological Society and the diagnosis and treatment confirmed.

I first saw the case on Dec. 9, 1901, and one week later operated by cutting away the growth very carefully and scraping the sclera beneath until forced to desist for fear of exposing the ciliary body. The wound was closed by stitching the conjunctiva over it and antiseptic dressings were ordered. One week later the wound had healed nicely and only slight hyperemia remained. Three small dark spots (foci of cancerous pigmentation) were visible. It having been decided that it was safe to try the x-ray in preventing a recurrence the case was turned over to Dr. H. P. Pratt. The area formerly occupied by the growth was daily exposed to the

x-ray for from three to five minutes. No appreciable result was noticed during the first two weeks of treatment. An improved condition was apparent after the first month. Occasionally the patient complained of pruritis and lachrymation. At times the treatment was discontinued for two or three days owing to increase of hyperemia and sensitiveness. The condition of the eye has, in the main, steadily improved and one after the other the dark spots have disappeared until at present there is left only one minute speck showing the location of one of the foci of cancerous pigmentation.

Nine months and a half have passed since the growth was removed, and the present appearance would indicate that there is no likelihood of its return. The improvement under the x-ray treatment has been so pronounced that I am inclined to believe that the condition will eventually be entirely removed.

1101 MASONIC TEMPLE, CHICAGO.

UNNOTICED FRACTURES IN CHILDREN.

F. J. Cotton states that the systematic use of the x-ray has confirmed the suspicion that fractures not infrequently exist with but slight symptoms, that mere cracks may readily be overlooked, that incomplete fractures or complete fractures without displacement are commoner than was formerly supposed, and may exist without being suspected by the patient. Eighteen cases are reported, ten of fracture of the clavicle, three of the bones of the forearm, two of the tibia and three of a metatarsal bone, which illustrate the author's point.

In small children, where there is a history of a fall or other trauma, and especially where the arm or shoulder girdle may be involved, the only safe way seems to be to assume a fracture as probable, till every inch of bone has been gone over carefully.

Practical X-Ray Diagnosis.

Prepared by J. Rudis-Jicinsky, A. M., M. D., M. E. Cedar Rapids, Ia. Revised by M. U. Dr. Joseph Hoffman, Vienna, Austria.

A series of A B C teaching for workers in x-ray diagnosis and therapeutics, to be concluded in 20 lessons. Fully illustrated.

LESSON 15.

Leaden Box With Diaphrams.

We are now able to obtain body pictures in less time than formerly, owing to the fact that we have better and more powerful apparatus and that some of our tubes have a device by means of which the vacuum in a tube can be lowered or again raised at will. But the so-called self-regulating tubes on the market are not all perfect and do not give satisfaction always. We have not yet been able to secure a method for keeping the tube at a uniform vacuum, and the fluoroscopic examinations have to be still depended upon in determining the condition of each individual tube, as already stated. Besides we have to shut out the diffused x-rays to get satisfaction in our work. If a low vacuum tube shows the bones of the hand, arm, or leg plainly, the result may be negative if we endeavor to look through the body; and on the other hand with the high vacuum tube we may penetrate the heavy parts of the body, but

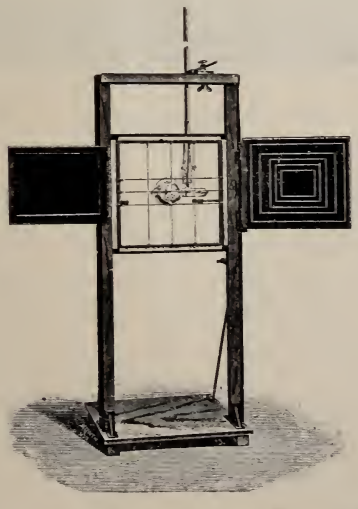


Fig 1. HOFFMAN'S MEASURING STAND.
(Page 1138).

without definition, and all that can be seen is a fussy outline of the bones. In the first case the penetrative power was not sufficient, and in the other too great with a strongly diffused reflection. To select a tube of proper vacuum, increase of definition without lowering the penetration should be our aim.

It is well known that more difficulties are met with in skiagraphing thick bodies than thin ones. A principal reason for this

Fig. 5. DENNIS FLUOROMETER, WITH PATIENT IN POSITION.
(Page 1138).

is found in that the x-rays undergo against all substances a strongly diffused reflection, the consequence being that at the corners or edges of an insusceptible substance the rays appear diffuse. This diffused reflection of light is particulary strong in the flesh of a person under operation. From every minute part of the flesh exposed, rays are independently directed upon the plate, and this is the reason that the skiagraphs of the buttock appear with so little contrast. To obviate this evil, care must be taken not to illuminate a greater part of the body than appears absolutely necessary to bring the entire plate used under exposure. By imagining the tube to be at a distance of 60 centimeters a hole of only half the size of the plate will be necessary to direct the operating cone of the rays upon the plate with their full effect. According to the instructions of Walter, Kohl, in Chemnitz, Germany, constructed the first leaden box, illustrated in the annexed Figure 7, which is designed for excluding the detrimental rays. We have used a similar box, but with the addition of a funnel-shaped receiver for our tube.

Tubes of higher exhaustion emit effective rays not only from the platinum plate, but also from the whole tube, these cross the cone of rays emitted from the platinum disk, and those generate shallow pictures. In order to still better keep off these rays we have constructed a receiver

for the whole tube, or better to say for the whole field of radiation of the tube. The description of the box, which nearly every operator can make for himself, is as follows:

The dimensions of such a box are 80x60x30 centimeters. It contains two semicircular openings sufficiently large to admit a person to lie beneath them. The box is completely lined with sheet lead of 2 millimeters in thickness; a strong and level board is affixed, which forms the bottom, and is also covered with sheet lead of thickness as stated, for keeping off the reflected rays emitted from the operating table. In the lid of the box a square hole is provided of 4 centimeters,

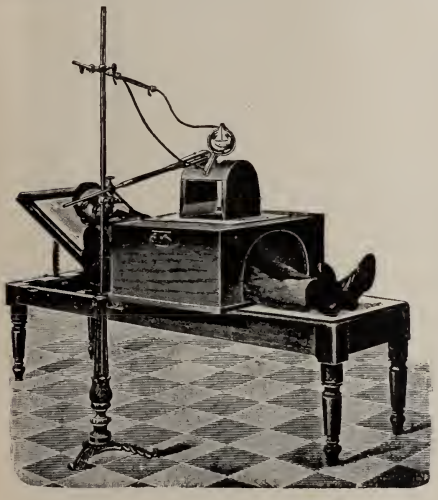


Fig. 7. LEAD BOX. PATIENT IN POSITION.

length and breadth, over which hole the diaphrams of lead with apertures of 15x20 and 20x25 respectively are laid to correspond with the plates 30x40 and 40x50.

In order to keep off the rays from the tube and disk a second diaphram of lead is provided, placed above the leaden diaphram of the box, upon wooden supports, the aperture of this diaphram being sufficiently large not to interfere with the cone or pencil of rays of the platinum-plate. In this work it is better to use doubly prepared plates, or better still, films enclosed in a casket, between two intensifying screens. The casket is likewise lined with sheet lead for the purpose of making ineffective the reflected rays, therein created.

We have to remember again that a tube to all appearances identical and constructed by the same maker will not always give the same results, and therefore we have to keep on hand a number of tubes supposedly of the same vacuum, and of the same make, so that our work may be conducted thruout under as nearly as possible uniform conditions. That is especially true in the work with a lead box, and heavy subjects.

PART SECOND.

LESSON 16.

The Study of Normal Anatomy.

To the already familiar methods of exploration of the human body in the study of normal anatomy we may now add the revelations and examinations by the x-ray, and in our diagnosis we have to compare always the normal shadows with the abnormal, remembering that a skiagraph can never be taken literally as such alone, and that, to interpret correctly a picture of this kind, we must be in possession of all the accessory facts and factors. The x-ray picture is of undoubted utility as an aid to proper diagnosis and treatment of certain lesions, but can not be depended upon and of itself would not be satisfactory proof in all our cases unless the shadows are verified by careful attention to details, comparison with the normal parts, and consideration of all other methods of practical diagnosis with all the knowledge of each individual case. There still seems to be a feeling among our colleagues that little is to be gained from the routine application of the rays in diagnosis, but the experience of the last few years does not support this opinion, for not only have a number of supposedly different lesions been diagnosticated properly, and mistakes made in the

usual way corrected, but many lives have been saved from the dreadful results of infection by the probe, many supposedly uncomplicated fractures proven more extensive than anticipated, and many cases found to be of quite a different character from what one would expect to find, judging from the history and physical signs.

We have to know our normal shadows first, before attempting the study of those which seem to represent pathological conditions. The study of normal structures is made easier and more definite by means of this new diagnosis, and the theory that x-ray examinations will finally result in the complete loss of the physician's or surgeon's sense of touch can not stand if we take into consideration how much more is gained by our mistakes and how much more attention we have to give to all details in order to benefit our patients to the greatest possible extent.

With the help of the x-ray we may study the bones, their position, structure, and substance. The relations in the joints can never be understood by artificial arrangements of a skeleton or rigid bodies in the dissecting room. By the x-ray we may see the actual movements and changed positions of bones composing the joints, observe the ligaments and the different layers of muscles in the living body. We may show in our skiagraphs the entire skeleton of an infant, observe the growth of bones, study the epiphyseal lines between the shafts of bones and make out the sensitiveness of the rays to the presence of any earthy salts in the cartilages, thus enabling us to show the very earliest beginnings of ossification in embryo, to the period of birth, and further in life. Cartilage is practically transparent to the rays. In this way we may find out that the ossification takes place a little earlier than our standard text-books state, and the detection is done before the knife and the naked eye could ever do it.

In teaching the anatomy of the movements of the lungs, the heart, the diaphram, the localization and the size of the different organs, or of hollow organs, as for instance the stomach, intestines, etc., we may take a good skiagraph of a living subject, and to certain extent replace both dissection and vivisection. The picture is taken in a few minutes, and will undoubtedly definitely settle some mooted points in each given case, will show us any deviation in the normal anatomy of certain individuals, and change some of our data, as put down in our rules. If we do not care for or do not need a picture, it is only necessary to take to our help Rollins' "Seehear," a combination of a screen and a stethoscope, having also a sound chamber. This instrument has the advantage in hearing the sounds in the chest of the person examined, while the organs are under inspection with the rays.

Even in the few years which have gone by since the discovery of Professor Roentgen, great progress has been made in x-ray technique so that we can now get skiagraphs which bring out most beautifully the internal structures of the bones, the ligaments, the different layers of muscles, and sometimes even some arteries, as described already in previous lessons. To the comparative anatomist the x-ray furnishes also an opportunity to study in better manner the bony and other structures of the lower animals. In teaching the anatomy of the blood-vessels we may inject the same with a substance opaque to the ray (such as red lead and starch) and thus picture upon the cadaver more accurately to the student the delicate distributions of the arteries and veins with their relationship to the osseous system than by any possible dissection. And sometimes we may find to our astonishment that the course of some normal vessels is not exactly the same in every subject.

As students of anatomy we are familiar with the structures of the bones; a description of these is, therefore, unnecessary.

Fig. 8. SKIAGRAM OF NORMAL CHEST.

Suffice it to say that in normal state on fluoroscopic examination the outline of the shafts must be even, and the marrow cavity show plainly, but when a skiagraph is made it must show the internal structure of the bone in comparative haziness, and this must be symmetrical in every part with the other member on the other side. The negatives are always better, and show more detail. Fluoroscopic inspection is the ocular examination, as we know. Though usually secondary in importance to skiagraphy, it should not be lightly regarded, but made always first, for it often furnishes much information respecting the condition of our tube, and gives us more satisfaction in the examinations, of the chest especially. There the shadow of a normal clavicle, for instance, is the best guide for further investigation and comparison. By fluoroscopic examination you recognize changes in the size, form or symmetry of the bones or the cavities of the body in which the different organs are lodged, and in the movements of their walls, during respiration for instance; as regards their size, rythm, frequency, or force, you may study them perfectly. The bones are opaque to the ray, more than the soft tissues, and using the intensifying screen we may exclude the light shadows of the soft tissues altogether on our pictures, if we wish to, or we may reverse the negative into positive, and print the bones in white, instead of black shaddows, to get more detail.

The most satisfactory way to do this kind of work, we have found, is to use a little flash powder in a dark room. You have to burn it about eight feet away from your negative, the quantity of powder depending on the density of the plate. But it takes very little. You have to fasten or hold a negative against a dry-plate just as we do in printing—a plate instead of paper—and expose it to the flash light, and develop our plate as usual, or you may expose the negative with your plate under for about one second, and no more, to the light. But if we are not in a hurry we may use sensitized paper instead of a plate, as stated already in previous chapters.

For osteology the x-rays have therefore an immense value.

The articulations under the ray give us different shadows, according to the various structures forming the joint. By careful manipulations, remembering the transparency of cartilages, we may get the shadows of ligaments in marked contrast with the bones, and then they show better than the individual layers of the muscles. The movements of the joints are always plain on fluoroscopic examination.

The arteries and veins do not show always, but may show on negatives which have been under-exposed. Their course, relations, and points of entrance from the cavities or near the openings of the bones may be studied in every case. The same with lymphatics and the nerves.

The skin gives us a line of haziness all around our subject on the screen or plate.

A detailed skiagraph of the viscera may be made, especially in children, if we cause distention of the stomach and intestines by some gas, or give the patient food mixed with bismuth subnitrate, or to drink a harmless fluid more or less opaque to the ray—albumen—before the picture is taken. Organs distended with gas allow the rays to pass freely, and thus the record of their location, movement and size is made. In adults Turck's gyromele, recording the size of the stomach or its condition, is still better procedure, giving the chance of skiagraphy, too.

The normal lungs are transparent, but the heart gives a beautiful shadow. The costal and diaphramatic breathing may be well observed with the help of our fluoroscope, the diaphram giving a marked shadow. In quiet respiration you will notice the abdominal wall rise with inspiration, and fall with expiration, at the same

time you will observe the lateral expansion of the lower ribs, and slight upward movement of the upper part of the chest, with inspiration, and down with expiration. In this way you may find that the lungs do not fully occupy the thoracic cavity, are not stretched, giving considerable alterations in each individual in the form and movement of the normal chest; and may make out the outline of the aorta in the thorax or other parts, with the anatomy of the trachea, larynx, hyoid bone, etc., when the plate is against the side of the neck. But we have to remember that in about half of the examined normal chests the right apex is not quite so clear as that on the left side, and that the clearness and transparency of the normal lung is much brighter at the end of inspiration. It is the same with the ribs, which are better defined at the moment of inspiration. Therefore before an x-ray examination of the chest ask always for deep, forced inspirations before and during examination to have the proper distention of the lungs. If we wish to study the relation of the trachea and bronchi to the thoracic walls on the cadaver, and demonstrate a picture to a class, it is well to harden our subject with formalin and inject a metallic alloy into the trachea and bronchi.

The relations of the different compartments and orifices of the heart to the chest walls may be made out on x-ray examination, and the whole topography of the heart and aorta studied. The heart and portions of the aorta are distinguished as a dark shadow extending from the first rib to the seventh interspace, and broader below than above. A portion of the aorta gives a light shadow in the first interspace, slightly to the left of the sternum. The auricles give a darker shadow on a line with the third costal cartilages. The right auricle, darker than the ventricle, extends across the sternum, a little beyond its right border. The middle portion of the left auricle may be seen plainly at the cartilage of the third rib. The right ventricle of a little lighter shadow lies partly behind the sternum, which gives a marked shadow, overlapping the shadow of the heart. The inferior border is on the level with the sixth cartilage, and the left ventricle lies to the left of the sternum, between the third and fifth intercostal spaces. These findings, with the distinctly visible cardiac impulse, in relation to the soft tissues can only be appreciated by examination of the negatives made in such cases. The apex of the heart appears to be invaginated during systole.

When examining we will find to our astonishment, perhaps, that the heart actually descends during inspiration, and the descent of the apex beat is not due—as we were taught before in our schools—to the lifting upward of the thoracic wall over the heart (See the skiagraph, Fig. 2.). When the breath is held the apex beat may vanish, but this is not due to the dilatation of the right ventricle pushing the left aside, but to the lung tissue which occupies the triangular space in front of the heart, causing the apex to go a little deeper and recede from the chest-wall. In old age the aorta may be larger, and the heart lower.

If a person be interposed between your fluoroscope and a Crookes tube, we shall see the beating of the heart, may measure its size, observe its volume and force, and represent all the changes that occur during the cardiac cycle. We may see the rise and fall of the ribs in respiration and the outlines with marked shadows of organs like the liver, spleen, kidneys, the vertebrae and the greater bones. The action of the diaphram may be well studied in every case, and we may see that during inspiration the same gives dome-like outline, and that the physiologic dictum, that the diaphram becomes flatter with each inspiration is not correct. Negatives which have been under-exposed, or made under the lead box with lead support and screens,

are always full of delicate, ghost-like, yet clearly defined outlines of skin, muscles, tendons and sometimes veins and arteries, beside the outlines of the organs as stated above. These details are entirely lost in print.

There are difficulties in x-ray examinations of the abdomen which are not met with in similar examinations of the thorax. Here we have more organs together in one cavity of loose walls, their action is not regular and rythmical, and their contents vary. To facilitate our examinations it is well to divide the abdomen into regions, as proposed by Bright, and prefer the plate to the fluoroscope (see lesson 15, Lead Box, etc.), using the fluorometer for measurement and better understanding of our pictures.

The topographical relations of the brain, the frontal and maxillary sinuses and the venous sinuses of the dura mater, the walls of the skull and their relation to the fissure of Rolando, the nasal septa, orbits and all cavities in the head may be made out and photographed. We may superpose on our plate the outline of cranial sutures, the meningeal grooves, the lateral sinuses and their relation to the venous sinuses, and make out the wings of the sphenoidal and the triangular base of implantation of the petrous on the squamous portion of the temporal bone; using this and similar data for the better localization and observation of relationship to convolutions and fissures.

THE KINDERGARTEN OF ELECTROTHERAPY.

BY T. PROCTOR HALL, A. M., PH. D., M. D.

1. Two kinds of currents are obtained from a static electric machine; namely, direct and alternating.

2. The direct current is obtained from the brass balls in front of the machine, one of which is positive, the other negative.

3. The positive pole of the machine is distinguished by the fact that when the end of a pointed stick is placed near it, and a little out of the line of the spark, the spark is deflected to the stick. This does not occur when the stick is near the negative pole.

4. When there are no leyden jars in use, and also when the jars are on but with their outer coatings disconnected, and the sliding rods are several inches apart, two other distinguishing marks are seen.

(a) The spark starts out in a perfectly straight line from the positive pole, and after going a short distance branches out in tree-like form. This branching is less distinct when the jars are in use.

(b) The spark is thicker and whiter a short distance from the negative pole.

5. When the sliding rods are brot closer, so that the small balls are half an inch to one inch apart, the spark has one other character by which the poles are distinguished; namely, at the positive pole the white portion of the spark is longer than the white streak at the negative pole.

6. Between these two positions of the rods, say when the balls are about 1½ inches apart, and at all times when the jars are in use with their outer coats connected, the spark is oscillatory; that is to say, it is a combination of the direct and alternating currents. The oscillatory spark is white over its whole length, and the poles are then usually indistinguishable except by the stick test.

7. The polarity of any static machine may change; more readily when the plates are not perfectly dry.

8. Change of polarity may occur:

(a) When the machine is at rest so long that the plates have entirely lost their charge.

(b) While the machine is in operation with an oscillatory current.

9. Since the sliding rods cannot be opened wide from contact, or closed when

far apart, without, if the machine is running, having the spark pass thru the oscillatory stage; during such opening or closing the polarity may possibly change.

10. The direct current in all cases forms a complete circuit; namely, from the brass ball forming the negative pole, along the rubber-covered rod to the plates of the machine, on the surfaces of the revolving plates to the points of the other rod, thence to the positive pole, and from the positive pole by means of chains, wires, gas or water pipes, the ground, the body of the patient, or the air, to the negative pole.

11. The Positive Electrode, or the Anode, is the extremity of any conductor from the positive pole of the machine.

12. The Negative Electrode, or the Kathode, is the extremity of any conductor from the negative pole.

13. When a patient is to receive the direct current, his body must form part of the electric circuit.

14. If the sliding rods are close together the direct current is completed by the small balls, and no current can reach a patient.

VALUE OF THE ROENTGEN RAY IN SURGERY.

Carl Beck (Medical Record, August 9, 1902) calls attention to this subject in these words, "What a triumph for suffering mankind are the numerous cases in which returned soldiers, contemptuously treated as malingerers before the courts, can now show the skiagraphic proof of the presence of foreign bodies. A patient whose body harbors a bullet has indeed a very good reason to complain. The number of patients who submitted to unnecessary surgical operations because foreign bodies were suspected but not found, and the still larger number of those who were not advised to submit to operation, altho needed on account of the non-suspected presence of foreign bodies, is legion."

American Electro-Therapeutic Association.

Twelfth Annual Meeting Held at the Hotel Kaaterskill, N. Y., Sept. 2, 3, 4, 1902, First Day—Tuesday, Sept. 2.

The meeting was called to order in the parlor of the Hotel Kaaterskill, Catskill Mountains, N. Y., by the President, Dr. Fred H. Morse of Melrose, Mass. At the opening executive session twenty-five new members were elected.

Report of Committee on Static Machines and Condensers.—Dr. William James Morton of New York city presented this report. He said the best static machine for therapeutic use is of the Holtz type, while the Wimshurst type is more valuable for x-ray work. He believed that in the near future much better static machines would be constructed, and thot a smaller size and higher speed a great desideratum.

Dr. G. Betton Massey of Philadelphia, Pa., objected to a high speed because of the noise, and thot a considerable amount of space necessary for proper insulation.

Dr. William B. Snow of New York city thot two sorts of machines entirely unnecessary, and suggested that for ordinary work some of the plates might be thrown out of action.

Dr. J. D. Gibson of Birmingham, Ala., thot the Toepler-Holtz machine better for x-ray work than the Holtz, though the spark from it is more painful.

The Action and Uses of the X-Rays in Therapeutics.

Dr. Wm. B. Snow, who read this paper, thot a static machine having 10 plates whose diameter is from 30 to 34 inches was the best for x-ray work. The effects of the x-rays are markedly chemical. Upon the living tissues the effects are: (1) Diminished nutrition; (2) inflammation; (3) necrosis. The intensity and extent of these effects depend upon (1) the character of the ray; (2) the length of

exposure; (3) the condition of the patient. Pigmentation follows long exposures. The x-rays destroy abnormal tissue elements without seriously injuring the normal tissues unless exposures are too prolonged. Lupus and epithelioma of the skin are invariably cured by the x-ray, especially when combined with the brush discharge from the wooden electrode (anode). No malignant tumor should be operated upon unless followed up by x-ray treatment.

Dr. C. R. Dickson of Toronto had known of x-ray treatment producing diarrhea in cases of internal cancer, just when the destruction of abnormal tissue was most rapid. He favored the brush discharge in all open cases. After tanning, the patient is much less liable to dermatitis from the ray.

Dr. Robt. Reyburn of Washington, D. C., said that the excessive current required in a coil made greater liability to x-ray dermatitis than when the static machine is used.

Dr. J. D. Gibson believed that all chronic inflammations could be improved by the x-ray, and advised its use in hemorrhagic fibroids.

Dr. M. F. Wheatland of Newport reported a case of chronic appendicitis which was benefited by x-ray treatment.

Dr. Francis B. Bishop of Washington, D. C., reported good results from x-ray treatment of tuberculous nodes of the neck, and of fibroid goiter with the brush discharge.

Dr. R. J. Nunn of Savannah thought x-ray burns and constitutional disturbances could be avoided by careful treatment. X-ray burns were produced as often by the static machine as by the coil.

Dr. William James Morton said results were obscured by combined methods of treatment. He saw no reason for expecting different effects from the use of the coil and static machine. The ray must be sufficiently intense to reach the part to be treated. Superficial cancers, particularly of the face, can almost invariably be cured by the x-ray alone. The treatment should cover a wide area and the position of the tube be changed from time to time. Carcinoma and similar growths in the abdomen do not remain local, hence the difficulty in their treatment. He advocated operation following the x-ray treatment, in order to shorten the cure. A prominent surgeon recently wrote him that he was an absolute pessimist regarding the curability of carcinoma of the breast by operation alone.

Dr. Snow said the character of the ray depended upon the vacuum tube more than upon the source of the electricity. In certain cases he had found that improvement followed the combined treatment, with the x-ray and brush discharge, where the x-ray alone had been unsuccessful.

The Treatment of Cancer by X-Rays.

Dr. Clarence Edward Skinner of New Haven read this paper, which was based on an experience in thirty-three cases. There was complete disappearance of the growth in two cases, permanent reduction in fourteen and permanent arrest in two cases. There was no effect demonstrable on the size of the lesions in fourteen. The general condition of the patient was permanently improved in eleven and temporarily improved in eight cases. A gain in body weight was evident in six, and no influence was apparent in twenty-seven cases. Hemorrhage was lessened in eight cases and uninfluenced in one case. Evidences of systemic toxæmia were noted in fourteen cases. Out of the thirty-three cases there were three apparent cures; thirteen were permanently benefited and were still improving; twelve were temporarily benefited; two were not benefited, and in three the treatment was discontinued too soon to expect any result. Every one of the cases was inoperable and presented a hope-

less prognosis. The three cured cases were as follows: (1) Round-cell sarcoma of the neck of three years' standing; (2) a case of recurrent carcinoma of the right breast with evidence of metastasis in the deep lymphatics of the trunk; (3) a nodulated palpable tumor, probably sarcoma, situated deeply in the lower lumbar and upper sacral regions.

Dr. J. D. Gibson of Birmingham, Ala., said that his experience had been that in superficial cancers the best results were obtained from the use of very soft tubes and close exposures, ranging from seven to ten minutes. In one or two of these cases he had used a high vacuum tube, and while it had caused considerable reaction the cancer did not seem to improve so rapidly as with the soft tube.

Dr. Robinson of Lexington, Ky., said that his experience had been that if there was much involvement of the tissues the soft tubes did not give such good results—in other words, that the soft tube only influenced the superficial tissues.

Dr. N. J. Nunn of Savannah thot we should speak of the penetrating power of tubes and not of "hard" and "soft."

Dr. Albert C. Geyser of New York city thot accuracy regarding the penetrating power of the tube scarcely possible. He distinguished high and low particularly by the color of the light emitted; green for high and blue for low.

Dr. W. B. Snow determined the vacuum of the tube by the spark gap. If the largest spark gap possible is, say, one inch, the tube is low, while a spark of 4 or 5 inches indicates a high vacuum. In a tube having a large bulb the vacuum does not change so rapidly from the heating of the anode and kathode.

Dr. G. Betton Massey said that if more than he claimed for mercuric kataphoresis were true there would still be an immense field for the x-ray treatment of cancer. The x-ray was easier of application, and would be found particularly useful in cases in which the area was too great for the successful application of a purely local treatment. In recurrent carcinomata of the breast the wide and deep penetration of the x-ray should prove especially valuable.

Dr. Robert Reyburn said that the reason the knife failed in the treatment of cancer was that the disease was always diffused beyond the part visible to the unaided eye and the knife laid open fresh channels of infection. The treatment of certain cases of cancer by caustic pastes was popular, because of its far-reaching action; and the x-ray acted in a similar manner, only with the important advantage that it yielded a much better cosmetic result.

Dr. Skinner, in closing, said that he was inclined to agree with Dr. Reyburn that the x-ray favorably influenced cases of cancer by exerting an influence on the surrounding cells, whereby the disease was walled off from the rest of the body. All of the cases reported in the paper had been treated with a Morton-Holtz-Wimshurst machine of twelve plates, and the effects had been such as to lead him to hope that still more might be accomplished by a sixteen-plate machine.

The X-Rays in the Treatment of Cancer.

Dr. J. D. Gibson of Birmingham, Ala., presented in this paper the clinical records of seven cases of epithelioma. He considered the x-ray, of proper penetrating power and when properly used, a specific for malignant growths.

Dr. Robinson of Lexington, Ky., believed the only way to conduct this treatment was by the use of a high vacuum tube, and he cautioned against too frequent treatments; twice a week was usually sufficient.

Dr. C. R. Dickson referred to the measurement of the penetrating power of the rays by thickness of tin foil.

Dr. H. Preston Pratt of Chicago said that thousands of lines of force were thrown off from the tube and the greater the concentration of these lines in a given area the greater the electro-chemical decomposition in that area, and hence the more rapid the changes in the tissues. After an experience of over six and a half years, and having given more than 30,000 treatments, he insists that a high tube must not be used; because the diminished number of the lines of force gives diminished action upon the cancerous growth. The healing of the surface which takes place when a high vacuum tube is used is due not to the x-rays alone, but to the static discharge from the terminals, which has also a tendency to spread the infection. A simple explanation of the action of the x-ray is found by supposing it to be similar to that of the ordinary electric current. On the side of the body exposed to the x-ray there is an acid reaction; on the opposite side an alkaline reaction. There is absolute proof that the action of the x-ray is due to changes produced in the ions by electrical force. Using a low tube on cancer, increasing the force of the machine increased the penetrating power of the rays. It was his experience that the static breeze in cancer cases is liable to cause muscular contraction and spread infection by pumping the germs thru the lymphatics.

Dr. Albert C. Geyser of New York city said that two years ago he had called attention to the advantage of using the static breeze on exposed surfaces.

Dr. Gibson, in closing, said that he had found the softest ray the most useful in skin cancers, but it required a ray of at least medium hardness to penetrate the body well. He was disposed to believe that the free use of the static breeze in the treatment was dangerous in that it favored the production of sepsis. While the breeze was an eliminator, it also served to increase metabolism, and apparently favored the dissemination of sepsis.

SECOND DAY—WEDNESDAY, SEPT. 3.

Electrotherapy and the St. Louis Exposition.

At the suggestion of Mr. W. E. Goldsborough, an associate member of the association, the following resolution was unanimously adopted, and a special committee was appointed to coöperate with Mr. Goldsborough.

Whereas, There is to be held in the city of St. Louis in 1904 an exposition of the arts and sciences of the world as an expression of our advanced civilization; and

Whereas, We understand that the provisions to be made for the exhibit of the progress of electricity will be adequate, and feel that electro-therapeutics deserve special recognition;

Resolved, That the American Electro-Therapeutic Association heartily commends and supports the plans which have been inaugurated for containing an electro-therapeutic display commensurate with the dignity and importance of this branch of electricity.

Epithelioma of the Tongue.

Dr. C. R. Dickson of Toronto reported four cases; results of x-ray treatment not so good as in some other malignant cases.

Dr. H. P. Pratt had treated four cases of epithelioma of the tongue and cured two. He thot now that the other two died because the static breeze which was used to relieve pain had caused muscular contractions and forced the infection along the lymphatics.

Dr. W. B. Snow said that he had used the brush discharge a good deal for its tonic effect upon open surfaces, and had not met with infection—indeed, it was an excellent antiseptic application. The patient should always be inductively insulated, the discharging rods widely separated, and the

wooden electrode insulated by a tapering covering of glass.

Dr. Francis B. Bishop expressed the opinion that one reason for Dr. Dickson's not having obtained a better effect from the galvanic treatment was that his active pole had too much surface for the amperage employed.

Dr. Dickson replied that it had not been considered advisable to use general anæsthesia, and it was for this reason that this size had been used.

Some Therapeutic Notes on the X-Rays.

In this paper Dr. Dickson said he preferred the static machine and the high vacuum tube. During the first two weeks of treatment the tube should be one or two feet from the patient, the distance to be gradually reduced to six inches. Daily treatments are advisable only in critical cases. The average seance is ten minutes. He had used adrenalin solution and found that it intensified the reaction. A vascular nevus was slowly disappearing under the x-ray. Several cases were described.

Dr. J. D. Gibson said he had cured lupus with the brush discharge alone, but preferred the x-ray. Cancers which have been surgically treated do not respond so readily to the x-ray.

Dr. A. D. Rockwell of New York city said the galvanic current and the x-ray relieved pain by causing a sort of circulatory drainage, diminishing pressure on the nerve endings. He preferred the so-called hyper-static current to the brush discharge, and had seen excellent results from its use.

FELLOWS OF THE ELECTRO-THERAPEUTIC ASSOCIATION.
Taken at Hotel Kaaterskill, Catskill Mts., N. Y., Sept. 4, 1902, by Dr. Marcus F. Wheatland.

Dr. W. B. Snow used a glass shield in closed cavities, and also glass vacuum tubes, as kathodes with the static machine. He had found the brush discharge from the wooden electrode satisfactory.

Dr. Willis P. Spring of Minneapolis considered soft dental rubber to be opaque to x-rays, and valuable to prevent short circuiting of the tube.

Dr. W. W. Eaton of Massachusetts had found the hyper-static current valuable in chronic eczema and in severe facial neuralgias. In carcinoma and sarcoma he ad-

vised the galvanic current with the x-ray.

Dr. H. P. Pratt declared that one cause of x-ray burns is that microbes from the atmosphere are driven from the surface of the tube into the body. This can be avoided by interposing a thin celluloid shield between the tube and the body.

Dr. C. E. Skinner did not favor this explanation, stating that one of his patients had been badly burned by the x-ray thru a surgical dressing.

Dr. R. J. Nunn said that if microbes could be driven in by the x-ray, so could other things.

Dr. Pratt replied that Dr. Alexander Wiener, a surgeon of Chicago, had invented a "celluloid cream" as a base, and with it he mixed 10 per cent of creosote. It was found that when this was applied over a tuberculous gland the creosote was driven in by the x-ray and the gland was reduced in two or three weeks. Experiments showed that the medicament was actually driven into the body.

A New System for Producing a Slow Alternating Current of Large Amperage for Therapeutic Use.

Dr. Lucy Hall-Brown of Brooklyn, N. Y., described and exhibited some apparatus, the invention of Mr. Patten, modified and manufactured by E. A. Callahan of Brooklyn. A continuous current, such as the Edison current, is transformed into a slow alternating current of a sinusoidal character. The current strength may be varied from zero to 300 or more milliamperes. The apparatus consists of a tub filled with distilled water, and having carbon plates on opposite sides. At the center of the tub is an insulated spindle, which is revolved by clockwork or by an electro-motor. At either side of this spindle is a plate of carbon or metal, the spindle and plates forming an armature. As the revolving plates approach the fixed plates a current is set up in the patient's circuit, and this gradually increases until the nearest point is reached. After pass-

FELLOWS OF THE ELECTRO-THERAPEUTIC ASSOCIATION.
Taken Sept. 4, 1902, by Dr. Willis P. Spring.

ing the terminal plates the current diminishes to zero again, the direction of the current changing.

Dr. A. D. Rockwell agreed with the reader of the paper that this current would not relieve pain when it was due to a neuritis or any acute or subacute inflammatory condition.

Dr. G. B. Massey and Dr. H. P. Pratt commended the apparatus and said they would expect very good results from it.

use by others of static electricity. The case was evidently of toxic and central origin and deeply seated. The treatment which he had adopted with complete success was as follows: A kathode of clay, three by four inches, was applied to the solar plexus, while the anode was applied by the labile method to the cervical and upper dorsal regions, and occasionally to the left arm. The strength of the current was from 20 to 60 ma., and the seances

FELLOWS OF THE ELECTRO-THERAPEUTIC ASSOCIATION.
Taken Sept. 4, 1902, by Dr. Willis P. Spring.

Current Differentiation Illustrated by a Case of Peripheral Neuritis Due to Parenchymatous Degeneration of the Cord.

Dr. A. D. Rockwell of New York city was the author of this paper. The case was presented: (1) because it illustrated a somewhat unusual form of neuritis; (2) as an excellent example of the necessity for careful differentiation, and (3) because of the prompt relief afforded after the failure of all other methods, including the

were of ten minutes' duration and were repeated daily.

Dr. Brower, Dr. Eaton and Dr. Massey referred to the tendency to neglect galvanic treatment on account of the greater convenience of static electricity.

Dr. F. B. Bishop placed the galvanic battery at the head of electro-therapeutical apparatus. Localized pain was often relieved by galvanism.

Dr. J. D. Gibson said it was exceedingly difficult to reach deep pains in the dorsal regions by the static current.

Some Therapeutic Indications from the Use of the Electric-Light Bath.

Dr. T. D. Crothers of Hartford, who read this paper, said that the sudorific action of the electric-light bath was superior to that of the ordinary hot-air bath. The bath that he had employed consisted of a room, five feet square and six feet high, lined with tin and lighted by one hundred incandescent electric lamps of sixteen candle power each. The entire body of the patient was exposed to the light in this room, the head being covered with a napkin, because experience showed that the treatment caused a marked drying of the hair. Sweating usually began in from two to seven minutes, and became profuse in from ten to fifteen minutes. The average duration of the treatment was twelve minutes. The regularity and force of the heart's action were increased by the treatment, and this improvement lasted for some time afterward. The patient was allowed to drink water very freely. After the bath, massage was given with hot or cold showers, and the patient then went to bed, the baths being usually given in the evening. The bath was found to promote sleep and diminish the cravings of drug-takers. The particular disorders which seemed to be influenced by the bath were neuritis, myalgia, and extreme nervous irritation. Arteriosclerosis appeared to be materially benefited by the electric-light bath.

Dr. W. B. Snow said that the therapeutic effects obtained by Dr. Crothers were due to heat and not to light; but higher temperature should be used.

Dr. Robt. Newman said that the light treatment is simply an imitation of sunlight, which is necessary to our existence.

Dr. M. M. Johnson of Hartford was convinced that part of the effects obtained by Dr. Crothers were due to light.

Dr. Chas. O. Files of Portland, Me., advised the exposure of the whole person, including the head, to the electric light in the treatment of tuberculosis. He used two arc lights and 35 incandescent lamps, either collectively or separately. The light bath promoted sleep and caused increased secretion.

Dr. J. D. Gibson had used lights of 8,000 candle power for tuberculosis, in a medium sized room, protecting the eyes.

Dr. Robt. Reyburn said that the transparency of the human body to sunlight is underestimated by most physicians.

Dr. Crothers said that any hyperesthetic part of the body became intensely red in the light bath. During the following day there was a feeling of contentment and exhilaration.

Some Obstacles to the Progress of Electro-Therapeutics.

Dr. Chas. O. Files of Portland, Me., said that one of the first obstacles encountered was the dense ignorance prevailing even among physicians concerning medical electricity. The remedy was to be found in the general diffusion of knowledge among physicians and laymen relative to the curative properties of the electric current.

A Portable Electric Apparatus for Medical Use.

Dr. Robert Reyburn of Washington, D. C., exhibited an apparatus, consisting of a wooden box, about six inches square, containing five dry compound cells, each made up of three cells, making the total voltage 22.5. The batteries, which cost forty cents each, are made for small electric-light outfits. The apparatus would yield a current of thirty or more milliamperes. Instead of the expensive and delicate milliamperemeter, he used Queen's galvanoscope. This can be calibrated experimentally with sufficient accuracy. One milliampere deflects the needle 10°. In place of the water rheostat he makes use of a rod of carbon, having a resistance of about four thousand ohms.

Newman's Portable Galvanic Battery.

Dr. Robert Newman of New York city designed this battery years ago, but had more recently modified and improved it. All parts of the battery are visible, and the apparatus is portable. The cells are empty in transit, and are only filled t the place where the battery is to be used. The ordinary acid bichromate fluid is carried in a concentrated form, and is thrown away after the battery has been used. A dilution of acid of one in ten or one in twenty is sufficiently strong, and two and a half ounces of bichromate of potassium are added for each ounce of the battery fluid. The battery consists of twenty hard rubber cells, with zinc and carbon rods for the elements. If desired, the battery can be used with only ten of the cells filled. The apparatus is provided with a simple and convenient current selector.

The Diffusion of Iodine by the Electric Current.

Dr. M. F. Wheatland of Newport presented this paper. His experiments showed that iodide of potassium followed the well-known physical laws governing electrical decomposition, and that there was no reason for believing that iodide is projected into the tissues by the *positive* pole, as asserted by some writers.

Dr. Robert Newman insisted that cataphoresis was only one part of electrolysis. He said that in the electrolysis of iodide of potassium the positive pole would attract the iodine and the oxygen of the acids, while the negative pole would attract the base, the alkalies, and the hydrogen.

Dr. H. P. Pratt said that he had succeeded in driving in iodine with the positive pole, but it had returned immediately. This was due to the fact that iodine is electro negative.

Arthritis Deformans.

Dr. Francis B. Bishop of Washington, D. C., in this paper said that in addition to a diet of proteids with an abundance of water, electric sparks to the joints or the wave current should be used. For an effusion into the joint he used a strong galvanic current. Electricity alone will not do; but in conjunction with proper diet a cure is possible.

Dr. Snow had treated 30 or more cases of rheumatoid arthritis with good success by using electricity to improve the general nutrition. Hot air treatment is valuable. Pain is relieved by the brush discharge.

Dr. D. R. Brower of Chicago advised an abundance of red meat and little or no sugar or sugar producing substances.

Dr. C. E. Skinner considered this disease to be of central nervous origin. He approved of a nitrogenous diet, electricity and hot air treatment.

Dr. N. C. Nutting of New Hampshire had found starch and sugar very injurious to rheumatic subjects. He advised plenty of meat and water.

THIRD DAY—THURSDAY, SEPT. 4.

The Relation of Psychic Suggestion to Electrotherapeutics.

Dr. Maurice F. Pilgrim of Boston discussed in this paper the philosophy of the healing of disease and the relation to true medical treatment of such fads as Christian Science. Great stress was laid upon the important part played by the *vis medicatrix naturae,* and a word of caution was uttered against hasty and enthusiastic generalizations and deductions from observations of the supposed effects of medicine and other means of treating disease. Emphasis was laid upon psychic suggestion as an important adjuvant to electrotherapy. By using psychic force in connection with electrical treatment without saying a word to his patient, he had been able to get better results than from electrotherapy alone.

Illustrative Cases in the Cataphoric Treatment of Cancer.

Dr. G. Betton Massey of Philadelphia reported a number of cases to illustrate the

efficacy of this method of treatment. Some of the clinical records were accompanied by photographs showing clearly what had been accomplished.

Officers Elected and Place of Meeting.

President, Dr. D. R. Brower of Chicago; first vice president, Dr. Maurice F. Pilgrim of Boston; second vice president, Dr. C. Frank Osman of Boston; treasurer, Dr. R. J. Nunn of Savannah; secretary, Dr. Clarence E. Skinner of New Haven; executive council, Drs. F. H. Morse and Charles O. Files. The next annual meeting will be held at Atlantic City in September, 1903.

CHICAGO ELECTRO-MEDICAL SOCIETY.

The fourteenth regular meeting of the Chicago Electro-Medical Society was held in room 912, Masonic Temple, Sept. 30, 1902, at 8:30 p. m., President Burdick in the chair. The minutes of the previous meeting were read and approved.

The resignation of Dr. A. W. Baer as an officer and member of the society was received and read, and on motion of Prof. Treadwell, was laid on the table until the next meeting. At the adjourned meeting this motion was reconsidered and the resignation accepted.

Professor C. H. Treadwell read a paper on "The Use of the X-ray in the Treatment of Cancer." The paper was discussed by Drs. Grubbe, Fitch, Burdick and H. P. Pratt.

Prof. C. H. Treadwell then moved that, in view of the fact that there are two factions in the society, and that the society's usefulness has come to an end in consequence, the Chicago Electro-Medical Society do now disband. The motion was seconded. Several members rose to discuss the question, but President Burdick refused to allow discussion. Appeal was made to Roberts' Rules of Order, but the president called for a standing vote. The motion was lost.

President Burdick declared the motion carried, and withdrew from the room, along with all who supported the motion. Dr. W. A. Pratt was then elected chairman.

Applications for membership were taken up for consideration, and the following were elected to membership: Dr. William E. Holland, Dr. Vine L. Smith, Dr. A. W. Smith, Dr. Fidelio F. Brown, Dr. R. L. Snow, Dr. J. Lloyd Hammond, Dr. J. E. Harper, Dr. John C. Delprat, Dr. Frank Doud, Dr. W. D. H. Brown, Dr. Ernest L. Hayford, Dr. P. C. Ridpath. Pursuant to notice given at the last regular meeting by Dr. H. P. Pratt, the revised constitution was read, and after being considered clause by clause, was adopted.

Notice was given of amendments to the by-laws to be proposed at the next regular meeting.

Dr. W. A. Pratt was elected third vice-president. The secretary, the third vice-president and Dr. H. P. Pratt were appointed a committee, with instruction to secure a charter from the State for the Chicago Electro-Medical Society. Dr. H. P. Pratt was appointed a committee of one to negotiate regarding affiliation with the Chicago Medical Society or the State Medical Society.

It was moved, seconded and carried that THE AMERICAN X-RAY JOURNAL be made the official organ for a period of five years from this date, and a committee consisting of Drs. Smith, Bartlett, and Replogle were appointed with power to conclude financial terms with the publishers. The society then adjourned the session for one week, instructing the secretary to arrange for a place of meeting and notify the members then present.

At the adjourned meeting a paper by Dr. J. E. Harper, on a Case of Melano Sarcoma of the Eye, was read by the secretary and discussed by Drs. W. A. Pratt, L. D. Rogers and C. H. Upton. On mo-

tion it was resolved that the publication committee be directed not to publish Prof. Treadwell's paper, as it was not considered of sufficient interest to members of the medical profession.

The following new members were elected by unanimous vote: Dr. Geo. F. Hawley, Dr. W. K. Harrison, Dr. L. W. Rowell, and Dr. Byron Robinson.

Dr. E. S. Pettyjohn was elected first vice-president.

The following additions and changes were made in standing committees. The membership committee to consist of Drs. Bartlett, F. H. Blackmarr and Wm. E. Holland.

Publication Committee, Dr. H. P. Pratt, chairman.

Scientific Research, Dr. Byron Robinson added.

Executive Committee to consist of Dr. H. P. Pratt, chairman; Dr. J. E. Gilman and Dr. L. D. Rogers.

Judiciary Committee, Dr. L. D. Rogers, chairman; Dr W. A. Pratt and Dr. A. W. Smith.

Charges were preferred against the president, Dr. G. G. Burdick, for conduct unbecoming an officer of the society, and against Drs. Burdick, Grubbe, and Street, and Messrs. Treadwell, Friedlander, Slater, and Scheidel for conspiracy to defeat the objects of the society. The charges were received and referred to the judiciary committee, which was given power to cite the said members before them or before the society.

It was resolved that the meetings should be held on the fourth Wednesday of each month, unless otherwise ordered by the executive committee.

The executive committee was also empowered to take such steps as it may deem necessary in order to protect the legal rights of this society. The meeting then adjourned.

T. Proctor Hall, Sec'y.

Editor American X-Ray Journal:

There is a good field here for the x-ray work and no practitioner that is competent. I wish a thoroly competent, magnetic, high-toned partner, with plenty of good common sense and experience (not bluff but sense and experience). Can you put me in communication with such a person? One you can recommend, a good financier. The opening is here, but I do not feel myself competent to undertake it alone, the responsibility is too great. I am equipped with the Betz static machine and appliances, with the exception of the screens. Among your many pupils you may find some one who will wish to come to this delightful spot. Some capital is required. Respectfully,

H.

Some of the Therapeutic Uses of the X-Ray.—E. D. Bondurant reports a case in which the use of the x-ray completely relieved the pain of a carcinoma of the face, caused a cessation of discharge and the formation of healthy granulations, the present condition being that of a fairly healthy ulcer, which is steadily healing. In a second case there is apparent cure of an epithelioma of the face; in a third the progress is extremely satisfactory after only eleven treatments; and in a case of lupus, the nodules are shrinking and the ulcerated surface is healing after ten sittings. A specific effect in relieving pain has been attributed to the x-ray, with ample confirmatory evidence. It has a remarkable influence in stopping the pain of carcinomatous growths, and the author has known it to cure facial and intercostal neuralgia, headache, and functional nerve pains. The permanence of the cures of epithelioma, lupus, etc., can be demonstrated only by time. Recurrences have thus far been infrequent, but not unknown.

EDITORIAL.

In the treatment of urethral strictures by electrolysis, the venerable Dr. Robert Newman is both pioneer and acknowledged master. His results are unquestioned and marvellous. His method has borne the test of time and is now widely used in different parts of the world. The essence of his method is the solution of the stricture by the chemical action of the negative electrode, using no force, and with such a small current that the slight inflammation induced by the operation soon subsides. We commend Dr. Newman's clear and concise paper to the attention of every surgeon. When such painless, safe and perfect results are attainable by electrolysis the use of the cautery or knife is hardly justifiable.

ROENTGEN RAY SOCIETY.

The next meeting, which will be held December 10 and 11, at the Sherman House, Chicago, will undoubtedly be the largest and best meeting in the history of the Society. Under the able direction of the executive committee, of which Dr. Weston A. Price is chairman, a superior program has been arranged; and many features of unusual interest are being prepared.

No one who wishes to keep himself abreast of the times in x-ray work can afford to miss this meeting. Physicians especially should make it a point to be present and join the Society. The JOURNAL will be glad to receive and forward applications for membership, and give any information that we are able to in reference to the meeting. Physicians and others are invited to make our office their headquarters during their stay in the city, and have their mail addressed to our care, 1207 Masonic Temple. Dr. Price reports that arrangements are well under way for reduced rates by rail from all parts of the country.

Exhibitors of apparatus connected in any way with x-ray work can arrange for floor space with the chairman of the local committee, Dr. Ralph R. Campbell, 414 Marquette building, Chicago.

COMMERCIALISM IN MEDICAL SOCIETIES.

The commercial spirit finds its way into even the healing art. For some time this had been felt by the members of the Chicago Electro-Medical Society, and notice had been given of changes in the constitution which would decrease the power of non-medical or associate members of the society, from whom chiefly the commercial impulses seemed to be derived. In order to forestall this action a puerile attempt was made by these associates, supported by the president and two or three members of the society, to disband the organization. The conspirators had previously secured from the State a charter for a "Chicago Electro-Medical Society," the existing organization not having had a state charter. The charter of the conspirators is perfectly useless to them, since they can be easily enjoined from using it; but the fact that such an attempt was made to capture the organization is a warning to all to draw the lines strictly according to medical ethics. Charges have been preferred against the conspirators by the society. Since the revision of the constitution and the practical withdrawal of the disturbing element, a large number of new members has been received into the society, and many more applications are on hand.

At the next regular meeting, which will be held at room 912, Masonic Temple, Wednesday, Oct. 29, at 8 p. m., papers will be presented by Dr. Pettyjohn, Dr. Blackmarr and Dr. Hall. All physicians and others interested in the medical applications of electricity and the x-rays are invited to visit the society.

Charles Warren Allen, M. D., in the Medical Record for January 25, 1901, reported the x-ray treatment of "Six cases of epithelioma—one upon the chin, two upon the nose, one upon the finger, one upon the forehead, and one upon the cheek. Four were recurrent cases, and one primary. One disappeared from observation; the others have done well, and might be considered cured, but all are still taking ray treatment, and I trust will continue to do so for some months. Besides these cases, I have observed a number of others, and have seen a number of times in consultation a gentleman with an extensive recurrence, in whose case the x-ray has been practically the only form of treatment applied. This extensive growth has decreased nearly one-half in size, and the general condition has improved, encouraging us to persevere in it.

"Most of my work has been done at rather close range—three to five inches. With the glass at an inch or less from the skin, as I have at times used it, the anode is still several inches away, when a large tube is employed. The nearer the tube and the longer the exposure, the greater is supposed to be the danger of 'burn.' Still, in such a severe affection one might be justified in taking a certain chance, and if the 'burn' affects the diseased area alone, I am not sure that the cure would be delayed in consequence. At times there seems to be a marked lessening of pain in the part after the ray treatment, and this effect has been noted in other conditions, such as articular rheumatism, gall stones, etc.

"Effects noted upon an open ulcer are usually a lessening of exudation, if it has existed; a drying up and glazing over the parts, and desquamation about the margins, from which cicatrization takes place. Sometimes there is a suppurative breaking down of neoplastic tissue.

"The prevailing opinion seems to be that a tube, to do the best work in skin diseases and cancer, should run low, *i. e.* that the vacuum should not be too attenuated, the tube thus running on about two or three inches of spark on the outside and giving poor penetration, *i. e.* if the hand is held before the fluoroscope, you should get a dense, black shadow of the hand without differentiation of tissue and bone." (That depends upon the depth and density of tissue to be treated. The tube should produce rays that penetrate every part of the cancer.—Ed.)

"Williams has employed 220 volts with two amperes and 35 cm. spark-gap, without causing dermatitis.

"Williams states his perference for the static machine for therapeutic uses of the rays. Others prefer the coil. As to strength of current, Freund advises an electro-motive force of 12 volts, with 1.5 amperes resistance, and a spark-length of 30 cm., or about 12 inches.

"The ray is always the same no matter how produced, and this is a point which is not always appreciated. Whether our electrical apparatus is static, high frequency, or induction coil; whether large or small, powerful or weak, if it produces an x-ray that will do the work, *i. e.*, if there be sufficient current and sufficient spark-gap, this ray is as good as any other ray produced in any other manner."

Statements about the number of volts and amperes of the primary current give as much information about the x-rays as we would get by knowing the length of hair and color of eyes of the man who watched it, and no more. The phrase "1.5 amperes resistance," while presumably a misprint, is in keeping with the deplorable ignorance shown by the whole paragraph. The criticism, implied rather than expressed, in the second paragraph above is entirely too mild for the occasion. A similar statement made by Dr. Pusey was criticised by Dr. H. P. Pratt in the Chicago Electro-Medical society as follows:

VARIABLE FACTORS IN X-RAY PRODUCTION.

I notice in the December number of the AMERICAN X-RAY JOURNAL a letter from Dr. W. A. Pusey of Chicago, in answer to a letter of inquiry in relation to a reprint of his on the x-ray in the treatment of skin diseases, in which he discourages the use of the static machine for x-ray work in treating acne, hypertrichosis, sycosis, etc., and gives reasons for the same. The following is a quotation from his letter in the Journal: "It is necessary that all the factors involved in producing the light (x-rays) be definite, and that there be repeated exposures to a weak light, the effect of which may be controlled, rather than the use of a strong light for a few exposures. As I said in that paragraph, I used the technique suggested by Schiff and Freund, described in my previous article, in which the light is produced by standard current of twelve volts and one and one-half amperes and a coil of 30 cm. spark length. I believe it is only by maintaining your factors definite and using a weak light that you can pursue the method with safety in all cases. The light produced with the static machine is in quantities which are greater than is safe to use repeatedly for long exposures and there is no way of accurately determining the factors in the production of light."

Such statements as these are misleading and misrepresent the facts, and physicians having a thoro knowledge of x-ray physics will bear me out in this statement. It is true that there is yet a good deal to be learned about the physics of x-rays, but if there is one thing that all experienced operators have demonstrated to a certainty, it is that it is impossible to maintain definite factors.

The force projected from the vacuum tube is electric in character and of very high potential, it acts on matter in the same manner as any electro-motive force; that is to say, it produces a dissociation of molecules along its lines of force, which is electrolysis. The light which is emitted from the vacuum tube is the result of the decomposition of the molecules in the atmosphere around and inside the tube. This light is not the x-ray current; the x-ray force is purely electrical and is invisible. It appears to me that if we consider the x-ray as an electric current of very high potential which makes its circuit from the inner surface of the tube outward, perpendicularly to the surface, then radiates in straight lines until the potential falls, when the rays return to complete their circuit by the terminals, we have a simple and practically useful explanation of all the phenomena.

The x-rays are produced by the bombardment of the molecules of residual gas against the inner surface of the tube. The number of molecules of gas in the tube determines the degree of vacuum. When the tube is excited, some of the molecules of gas are thrown from the kathode against the antikathode which serves as a target, causing the molecules to rebound and strike the inner surface of the tube. This point of impact on the inner surface of the tube is the source of the x-rays. Every molecule of gas striking the inner surface of the tube causes one or more lines of force to be thrown out at right angles to the surface of the tube. The distance to which the lines of force are projected, or, in other words, the limit of the penetrating power of the ray, depends entirely upon the potential of the tube, and this, in turn, depends upon the force of impact of the individual molecules of gas. The higher the vacuum the less the number of molecules of residual gas in the tube; the greater the free path, the lower the potential and the less the penetrating power. The lower the vacuum, the greater the number of molecules; the less the free path, the lower the potential and the less the penetrating power. The force projected from the x-ray tube, being electrical, must follow Ohm's law. The cur-

rent is equal to the electro-motive force divided by the resistance; that is to say, the potential of the tube may conceivably be measured in volts, the resistance to the x-ray current measured in ohms, the amount of current measured in fractions of an ampere, and the amount of work done measured in a fraction of a watt. To obtain the measurement it requires an expert physicist; the poor doctor is not in it.

So you will see there are three factors that enter into the problem of the x-ray current—the potential, the resistance, the current—with no one constant factor. They vary with each excitation of the tube; this variance is due to the degree of vacuum and the force of impact of the molecules of residual gas on the inner surface of the tube. With each excitation of the tube the vaccum increases, thereby changing the other factors, so that the main and almost the only factor is the degree of vacuum in the tube, and not the form of apparatus used in exciting the tube. The degree of vacuum required varies according to the part being treated, and can only be determined by close observation of the working of the tube and the susceptibility of the patient to electrical influence. This is the whole thing in a nut-shell. There is no one method that can be followed; you must vary the factors to suit the case. If Dr. Pusey is of the opinion that with a coil of 30 cm. spark length, voltage of 12, and an amperage of one and one-half, he can maintain a definite amount of energy in the tube, he is laboring under a misapprehension. He must study the tube factors first and vary the other factors to suit. While the amperage and voltage is for all practical purposes constant, the work that is being done is almost entirely confined to the tube, which is constantly changing the degree of radiation. The doctor has the cart before the horse.

The tube's radiation should be kept constant, as far as possible, by varying the force in the apparatus which energizes the tube. It must be remembered that the tube varies with each excitation, and consequently it requires an increase or decrease of the amperage on the primary circuit to keep the tube at a comparatively constant radiation. But complete constancy is absolutely impossible, as the vacuum increases every time the tube is excited, consequently changing the degree of the radiating energy. It must not be forgotten that the x-ray current produces an electrolytic effect on the tissues of the body; this electrolytic effect is increased or decreased according to the number of lines emanating from the tube.

All substances thru which the x-ray passes form part of the x-ray circuit. When this radiating energy comes in contact with the tissues, it changes the relationship of the ions composing the same, producing an increased metabolism. The static machine can be harnessed up by an expert to produce the same results as the doctor obtains from his coil.

In the Medical Record Mr. Chisholm Williams of London described his results in the treatment of pulmonary tuberculosis by means of electrical currents of high frequency and high potential. He referred t forty-three cases so treated, all being of a severe type. At first, after each application, the temperature rose, but each successive rise was less, and when no rise followed, arrest of the disease had occurred.

CORRESPONDENCE.

Chicago, Oct. 3, 1902.

The Editor of American X-Ray Journal:

In your August issue, under the heading, "Glass vs. Mica Plates," we note, in commenting upon our acceptance of the challenge made against our statement that "2 *Mica Plates equal 10 Glass Ones,*" you suggest that in addition to the machines selected for trial, viz., the worst that can be found by the opponent in each case under R. V. Wagner & Co.'s conditions, each contestant be asked to furnish the best machine he is able to produce. If you will refer to our acceptance of this challenge you will note that we specifically state as one of the conditions that "the machine selected for the test shall have been sold in the open market, by the respective contestants, *within two years,* and shall be selected from the offices of parties now using the same, or trying to do so; we to furnish the machine manufactured and sold by our opponent, he to furnish any 4-plate Mica Static machine which has been sold by us. It is understood that these machines shall not be broken, or otherwise injured, and that each party shall have six hours prior to the test to produce the necessary adjustments for making the machine work at its best, but not to replace or add parts."

A machine sold within two years should not be the worst that can be found, and a machine that has been sold within two years that cannot be put into first class condition in six hours, even with the worst kind of usage, would show very bad construction on the part of the maker.

Our reasons for making this condition, which we consider absolutely fair, are that those interested in static machines, or contemplating the purchase of a machine, are not concerned about the best machine that can be made by each manufacturer, as suggested by you, but they are, or should be, greatly concerned in the kind of machine that they are expected to pay their hard-earned dollars for, to-wit, the machine which is being offered by the manufacturer in the open market. Any machine which we have sold in the last two years is just as good as we know how to make, and our competitors, after having made so many unfair statements, without any foundation of truth whatever, that Mica Plates scale, crack or otherwise deteriorate with age, ought to be glad to have an opportunity of selecting one of our machines which has been in use for a couple of years. If our competitors' machines have such superior lasting qualities, why do they object to the use of a machine for the competitive test which has been out for a period of two years only, or less? The only reason is that unless the glass-plate machine was especially constructed it can not safely be run at a very high speed, and it is a well known fact that the faster a static machine is run the more current it will generate.

The advantage which we derive from the use of Mica Plates is principally due to the high speed at which they may be run. If two glass plates could be run at as high a speed as two mica plates, the volume of current would be nearly the same, other things being equal. Any manufacturer of glass-plate machines could, by a very careful selection from a large number of plates, procure enough for a test machine practically true, which would permit of higher speed. For a test machine the plates could be heavily bushed with soft rubber, so as to greatly decrease the amount of vibration, which is what breaks glass plates when revolved at high speed. Glass plates could also, for a test machine, be ground off on the heavy side and perfectly balanced, which would greatly reduce their liability of breakage at high speed; but none of these conditions are complied with by makers of glass-plate machines in their commercial article; the expense of obtaining perfectly true plates would be too great. Soft rubber bushings could not be used because they would very quickly rot from

the action of ozone, and we know of no one that is grinding revolving glass plates so as to perfectly balance them.

The only possible way any static machine can compete with the Mica Plate, in any way, will be that it is so constructed as to permit of a high speed, as the high speed not only greatly increases the volume of current, but develops a very high tension current, which is superior for X-Ray and most therapeutical purposes.

Glass Plate machines with plates as large as 28 inches in diameter, as found in the open market, will not safely permit of being run at a speed of over 500 revolutions per minute; disastrous results have often been obtained at a much lower speed than this, and in any competitive test of glass plates, as compared with Mica ones, the great difference in speed at which they can be run will substantiate our claims for Mica Plates.

It is easy enough to make a challenge, but it is also very easy to do nothing after the challenge is accepted. We are surely ready to make any reasonable concession on our part in order to procure a competitive test. Yours very truly,

R. V. Wagner & Company,
R. V. Wagner, President.

Editor American X-Ray Journal:

I have a static machine with seven 28-inch revolving plates and wish to increase the output by adding another machine Do the two machines have to be exactly alike? [No.] Or will any two machines work together? [Yes.] Does the speed of the machines have to be exactly the same, and do the plates have to be the same size in both? [No.] Is it customary for manufacturers to supply machines with 28-inch revolving plates when 30-inch are promised, and so specified in order? [No.] W. C.

Editor American X-Ray Journal:

Permit me kindly to differ from the following under editorial notes, "Electricity is not a cure-all. It is a form of energy which can be advantageously used to cure disease, differing not at all in this respect from heat, light and other physical agents."

Now this explanation was satisfactory enough a few years ago when Webster, Worcester and Gould inserted a lot of nonsense to cover up ignorance, in place of a definition.

Even Kulle, the author of "The X-Rays," declares that electricity is a force, not a substance, and is constantly trying to reach an equilibrium, etc. Prof. A. E. Dolbear, the eminent physicist of Tuft's College, Mass., deprecated all allusions to electricity as a force external to matter and independent of it. Electricity, light, heat and chemic action are inherent properties of matter, electricity being the rotatory property of atoms, light the vibratory property, etc.

Without oxygen, I defy you to generate or produce any kind of an electrical current, whether galvanic, faradic, static, x-ray, or any form whatever. It is an utter impossibility to do so. Quibble over this assertion as much as you choose, I request a demonstration to disprove it.

Then this thing with a misnomer, so-called electricity, is of humble orign, is of the Gas family, none the less respectable, equally useful as a curative, as if under the miraculous, misconceived name of energy, force, agent, etc.

Aid me in promulgating this discovery to the profession; it is not protected by copyright. Neither will there be any demand to fight over priority. It is for the enlightenment of all humanity. Electricity is a misnomer. Ozone is the title; it is a substance. With high esteem, I subscribe myself, Ozonely Thyne,

Theo. F. Johnson, M. D.

[Professor Dolbear's view is correct. Neither electricity nor any other form of energy appears "external to matter and independent of it." But to argue from this that electricity is a form of matter,

is to confuse things that are entirely different. Matter has weight, and is composed of atoms. Ozone is one kind of matter. Energy is the capacity for doing work. It is measured by the amount of work it can do, in any given case. For instance, the difference between a coiled watch-spring and a loose spring of the same kind is that the coiled spring has energy (can do work) that the loose spring does not have. Heat is a form of energy, that is to say, a hot body can do work which the same body when cold can not do. Electricity is a form of energy, that is to say, an electrified body can do work which the same body unelectrified can not do. No man who has even a faint idea of the meanings of the words electricity and energy can deny that electricity is one form of energy, or can assert that electricity is ozone. These two, electricity and ozone, are often associated; but association is not identity. For an example of electricity without oxygen our correspondent is referred to the common Le Clanche (Zn, NH_4Cl) cell, in which the water acts only as a vehicle for the salts. If this is not satisfactory on account of the presence of the water, we refer him to a dynamo, for whose working neither oxygen nor any of its compounds are essential.—Editor.]

H. P. Pratt, M. D.:

Dear Doctor—I have not been able to find much on x-ray treatment except what is in your journal.

I have plenty of patients to use the x-ray on when I get my outfit, but feel shaky about starting, and would like your advice. Man, 45 years old; cancer three inches up in rectum, large as a goose egg. Must I expose up rectum, or can I treat through abdomen? How often and how long exposure? Is there more danger of a burn through the rectum? Will covering with vaseline help to prevent a burn? What would be the prognosis, and shall I try it? In treating tuberculosis, how near should the parts be to the tube, and how often should I expose? How long after exposure before a burn shows up? How shall I know when to stop exposure on account of liability to burn? Do you advise getting a Finsen Ray that Betz is going to have soon, and is there as much danger of burn from that?

I thank you for your courtesy while I was in Chicago, also for answering my questions.

Respectfully yours, E. A. L.

[Expose thru a rectal speculum with a low tube, and also thru the abdominal wall with a higher tube, alternating daily. Begin with 5-minute exposures per rectum, 7 or 8 minutes externally, and gradually extend to 10 and 15 minutes. When the mucous membrane or the skin becomes red and very tender, stop treatment a few days, and use mild antiseptic dressing to prevent infection.—Editor.]

Editor American X-Ray Journal:

Dear Sir—As to the therapeutic quality of treating "birth mark" with the x-rays, I can find no reference. I have commenced to treat such a condition and am exposing a small portion of the discoloration, intending to produce quite a burn and see what results are possible.

If you have any suggestions, would be pleased to have them, and will give you an explicit report of the outcome.

Very Respectfully, H. W. W.

[Birth marks have been treated successfully by the x-ray by a good many operators. A low tube is best. It is not necessary to cause a severe dermatitis.—Editor.]

Editor American X-Ray Journal:

Dear Doctor—I want your American X-Ray Journal, and in the scramble I have lost my sample copy. Please have me the September number sent with a subscription blank. I have a case of tubercular cystitis, which is very interesting. She has a spinal lesion, showing self-limiting and self-recovering Potts' disease. I evacuated the abscess and removed half the right mammary, for tubercular abscess, a year ago. The bladder and bowels caught up the infection. I have given her 15 x-ray treatments, 10 to 12 minutes each, until the abdomen showed slight erythema. The lymph nodules in the groin seem to be clearing up, and her general condition seems to improve, appetite, etc. The neck of the bladder at the urethral orifice is the seat of ulceration—how extensive I cannot tell. She has had no hemorrhage. This ulceration is very painful sometimes, during micturition and when the bladder becomes distended with urine. I have used the Crookes tube above the pubes, and don't know how to reach the ulcer for

exposure, the pubic bone being in the way of the urethra. The treatment has not relieved her pain; if anything, she seems to suffer worse. I also inject daily a 5 per cent iodoform emulsion. I have fought this case desperately with tonics, nuclein, etc. I now have her on pepto-mangan (Gude). Have been giving her formamin for six months, 20 grains daily. She has held her own comparatively well, only having lost 10 pounds in a year. Tubercular bacilli are still found in the urine. Can you suggest anything that would be of benefit, or do you know of any cases treated, together with prognosis? This is a dreadful thing to happen anybody. It takes ½ grain morphia to relieve the excruciating spasmodic attack which comes on after using the urethral dilator, or every day or so if no treatment at all is instigated. Excuse the length of this. Anything you suggest will be appreciated. Sincerely yours.

C. L. H.

[Use a thin celluloid speculum, and treat through the vagina. Protect the external parts by lead-foil.—EDITOR.]

Meeting of the Roentgen Ray Society.

The next meeting of the Roentgen Ray Society will be held in Chicago, December 10 and 11, and promises to be the best meeting in the history of the Society. A very fine program, which will be announced later, has been secured, and on it are several of the leading men of Medicine and Science. We will have a manufacturers' exhibit, showing the latest improvements and most approved forms of apparatus. The local preparations are in the hands of a most excellent Committee, as follows:

DR. RALPH R. CAMPBELL, *Chairman*.
414 Marquette Bldg., Chicago.
DR. JOHN B. MURPHY,
Reliance Bldg., Chicago.
DR. LOUIS E. SCHMIDT,
424 North State Street, Chicago.
DR. M. L. HARRIS,
100 State Street, Chicago.
DR. W. L. BAUM,
103 State Street, Chicago.
DR. H. G. ANTHONY,
465 Dearborn Ave., Chicago.
DR. W. A. PUSEY,
Columbus Memorial Bldg., Chicago.

For any particulars or information, write to either the Executive Committee or the Committee on Arrangements.

WESTON A. PRICE, D. D. S.,
Chr. Ex. Com.

X-Light in the Treatment of Cancer.*

BY PROF. CLARENCE EDWARD SKINNER, M. D., LL. D., NEW HAVEN, CONN.

Probably no event since the discovery of the value of antisepsis has attracted so much attention, from both medical men and laymen, as the discovery of the power of the x-ray to overcome cancer. The announcement of the fact was first met by derisive incredulity; next by an unwilling admission that beneficial results had certainly been observed simultaneously with the administration of x-ray treatments to sores that seemed to be cancerous; and finally, before an overwhelming mass of clinical demonstration, skepticism has given way to amazed conviction.

It is not difficult to appreciate the incredulous attitude of the medical mind in this connection. From time immemorial cancer has ultimately destroyed seventy per cent or more of the total number of its victims, in spite of any measure that could be applied for its relief, surgical or medicinal, and whatever the stage of the disease at which it came under treatment. Probably no other disease, with the possible exception of pulmonary tuberculosis, has been looked upon with so much hopeless dread and horror. Therefore, when the statement was made that x-light, which had not been previously known as a therapeutical measure at all, would not only entirely remove this hitherto intractable condition in many cases, but would accomplish the result without even producing discomfort on the part of the patient, it is not strange that the tidings should be looked upon as altogether too good to be true.

The beginning of the twentieth century has been marked by the discovery of many wonderful and valuable things in nearly

* Read at the twelfth annual meeting of the American Electro-Therapeutic Association, at the Hotel Kaaterskill, Greene County, N. Y., September 2, 1902. From the Official Organ.

every department of industrial and professional activity. We are living in a period of marvelously rapid progress and achieving results, which, even ten years ago, would have been looked upon as hopelessly beyond the limits of human possibilities. The development of the x-ray in the treatment of cancer will go down to history as by no means the least of the discoveries of any age that have proved potent in the relief of human misery and in the saving of human life.

For the purposes of x-ray therapy, cancers need be divided into but two groups: those affecting the superficial soft tissues, and those involving the deep tissues and bones.

The observations of Chamberlain, Pusey, Morton, Williams, Snow, Allen, Montgomery, Schmidt, and many others, including the speaker, have proven beyond any possibility of doubt that external cancer is curable by x-rays as far as physical examination and subjective symptomatology can discover, in at least the very great majority of cases. Present statistics indicate that the proportion of cures will exceed ninety per cent.

In the second category are included malignant processes extending or existing more than half an inch below the surface of the skin. Most prominent in this group occur mammary cancer, uterine cancer, malignant processes affecting the intra-abdominal and intra-thoracic lymphatics, and bone cancers.

The efficacy of x-radiance in curing cases belonging in the first group is now so well established that the greatest interest in the matter centers upon the deeply seated growths, and I shall confine my remarks principally to personal observations upon thirty-three cases of this character which I have had under treatment during the past nine months.

I was first led to believe that deeply seated cancers might be amenable to x-light by my conviction that the beneficial influence which the agent undeniably exercises upon superficial cancer is due to the x-ray vibrations acting upon the cell elements of the growth, which elements are too weak and lacking in vitality to reach maturity and become the specialized tissue for which they were destined of themselves, in such a way as to give them new vitality, and hence ability to reach maturity and their normal ultimate structure. I have never considered the effect to be due to ozone formation, electrification or electrolysis of the elements of the growth, the deposition of any acid upon the sore, or any other of the several explanations which have been advanced to the exclusion of a specific influence of x-light. We have used all these agents before, but they did not cure cancer until x-light came upon the scene.

With a good high-vacuum tube, one that forces back a spark-gap of not less than four inches, rays can be produced that penetrate clear through the body; hence a malignant growth in their path could not fail to be influenced by them, if x-light is capable of exerting influence. It was under the impulse generated by these thoughts that the study of the following cases was undertaken.

In order that the conclusions to be drawn from the observation of these cases, and to be stated later, may be grasped intelligently, it is necessary that the important points in each case be brought to view. The time at my disposal, however, will permit of but the briefest possible description, and if anyone desires further light in connection with any case it will give me great pleasure to answer his queries.

(To be continued.)

THE AMERICAN X-RAY JOURNAL

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PROFESSOR JOHN B. MURPHY, M. D.
Vice-President American Roentgen Ray Society.

THE AMERICAN X-RAY JOURNAL.

Devoted to Practical X-Ray Work and Allied Arts and Sciences.

VOL. XI. ST. LOUIS AND CHICAGO, NOVEMBER, 1902. No. 5.

PUBLISHER'S ANNOUNCEMENT.

THE AMERICAN X-RAY JOURNAL will devote its columns to the education of the medical profession in X-Ray and Electro-Therapeutical Practice.

This includes (a) X-Ray Diagnosis, both medical and surgical, the methods of fluoroscopic and photographic examination, of locating fractures and dislocations, renal and hepatic calculi, aneurisms, abnormal conditions of the heart, tumors, tubercular diseases, malformations, etc.

(b) X-Ray Therapy, treatment of cancer, tuberculosis, diseases of the skin, etc., etc.

(c) Electro-Therapy of acute and chronic diseases as follows: Mental and nervous; diseases of the heart, lungs, eye, ear, nose and throat; gynecology, obstetrics, genito-urinary diseases, diseases of children; skin, liver, kidney, rectal and intestinal disorders.

(d) Dental diagnosis and treatment.

X-Ray and Electro-Physics, insofar as they directly concern the physician and surgeon, will receive their full share of attention.

As far as praticable, each number of the Journal will contain articles in each of the following departments:

1. Scientific and original articles for advanced workers.

2. Clinical reports of x-ray therapy and electro-therapy. Every physician, no matter what school he belongs to, is invited to send for publication reports of his cases treated with the x-ray or electricity, not exceeding two hundred words. State exactly what you did, how you did it, and the results, and the Journal will be glad to give you the space.

3. Editorial News and Notes, giving the latest news in x-ray and electro-therapeutics from all parts of the world.

4. Queries answered by well-known specialists.

5. Lessons for Beginners, a complete course, consisting of 24 lessons, under the auspices of The Chicago College of X-Ray and Electro-Therapeutics, on the principles and practice of x-ray and electro-therapeutics. No physician can afford to miss this course. It is worth $100 to any practitioner.

We will expose fraud and charlatanism wherever we find it, and will exercise the utmost care to see that everything that enters the pages of the Journal is thoroly reliable. Truth is what we seek and truth we welcome from every source, giving credit where credit is due, without fear or favor.

The Journal will be enlarged as rapidly as necessary to meet all requirements. The subscription price will remain the same as heretofore, $3.00 per year in the United States, Canada and Mexico; $4 in foreign countries. Single copies, 50 cents.

SPECIAL NOTICE.

We are in receipt of numerous enquiries asking us to recommend physicians in various parts, who are competent to use electricity and the x-ray.

We propose to reserve space in our advertising pages for cards of those we know to be competent. For conditions and terms address the publishers.

Some Remarks on the Value of the Roentgen Rays.

John B. Murphy, M. D., Vice-President American Roentgen Ray Society; Prof. of Surgery, Northwestern Univ. Med. School, Post-Graduate Med. School and Hospital, and Chicago Clinical School; Attending Surgeon to Cook County Hospital, Mercy Hospital, etc., etc.

X-rays were discovered by Prof. Roentgen in the latter part of the year 1895. Early in 1896 experiments were begun in the hope that the rays might have some therapeutic value. Their diagnostic value was evident from the start, but it required persevering and careful investigation to develop their value as a therapeutic agent. Being interested, in common with other physicians and surgeons, in everything that promised to aid in the relief of suffering humanity, I, on June 8, 1896, referred to Dr. H. P. Pratt, who was then experimenting therapeutically with the x-rays, a case of lupus, suggesting that he experiment with this form of tuberculosis rather than the pulmonary form. The case was cured. This was, I believe, the first case of lupus to be cured by x-rays. From time to time since then I have recommended the use of the rays in different diseased conditions, with the view of determining to some extent their therapeutic value. The results of these experiments, and of thousands of others which have been reported, have accumulated such a mass of evidence in favor of the therapeutic value of the Roentgen rays that they are now universally thot to be the most important discovery, from a therapeutic point of view, of the close of the last century.

As an illustration of their diagnostic use, I may refer to the cases treated by Prof. Lorenz at the Mercy Hospital during his recent visit. The professor treated there twenty cases of dislocation of the hip joint by the "bloodless method," which consists in forcible extension of the muscles, particularly the adductors of the thigh, to such an extent that their elasticity is completely overcome, after which by a series of manipulations the head of the femur is made to rest in its proper position in the acetabulum without much tendency to return to its abnormal position. The limb is then fixed in the abducted position at right angles to the body by a plaster cast which is left on for a period of three to six months or more. The following is a summary of the cases treated by him:

1. Girl of five years; left hip; reduced with difficulty; well defined border to the acetabulum. Plaster cast to remain on ten months.

2. Girl of three and one-half years; tuberculosis of the right hip joint. This case was treated by the gradual process, namely, over-stretching the muscles and applying a cast to be retained for three months; the process then to be repeated as often as may be necessary to complete the reduction. A walking brace can be used on the limb, so that the child is not confined to bed for any length of time.

3. Boy of four; right hip; easily reduced. Cast to remain six months.

4. Gird of four years; double dislocation; left easily reduced, right with a little more difficulty. Cast to remain six months.

5. Girl of four; right hip; reduced without difficulty. Cast to remain six months.

6. Girl of eight; left hip; reduced with much difficulty, requiring forcible traction. There was some bruising opposite the trochanter. Cast to remain six months, then to be reapplied for two months or more.

7. Girl of seven; left hip; no difficulty; six months.

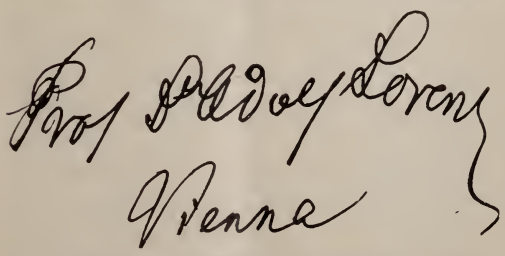
8. Girl of five and one-half; left hip; reduced by Dr. F. H. Brandt with considerable difficulty. It was necessary to stretch the anterior capsule. Cast to remain eight months.

9. Gird of five; right hip; reduced by Dr. Brandt with some difficulty. Anterior capsule stretched. Cast to remain six months.

10. Boy of eight; left hip; easily reduced; cast to remain six months on account of advanced age.

11. Girl of six and one-half; left hip; reduced with great difficulty. The femur broke two inches from the great trochanter. The head was brot near, but not into, the acetabulum and the leg was fixed in a downward position, with traction; to remain three months for healing of the fracture, after which complete reduction can easily be effected.

TAKEN IN THE OPERATING ROOM OF THE MERCY HOSPITAL, CHICAGO.



2. Dr. John B. Murphy, Chicago.
3. Dr. Frederick Müller, Vienna.
4. Dr. Dexter D. Ashley, New York.

Among other prominent physicians and surgeons present in this group are Dr. F. H. Brandt, Dr. J. T. Conley, Dr. W. G. Dye, Dr. McManus Hall, Dr. J. M. Neff, Dr. McCraig, Dr. Daley, Dr. Mullen, Dr. Chas. Elliott, Dr. W. A. Minick, Dr. McDonald, Dr. O'Neil, Dr. Courtwright, Dr. Wheeler, Dr. T. P. Hall.

Dr. Lorenz states that in all his experience he has had probably a dozen fractures. A fracture is liable to occur in difficult cases, but is not a very serious complication.

12. Girl of four and one-half; left hip; reduced with ease; shallow acetabulum; anterior capsule stretched. Cast to remain eight months.

13. Girl of four; easily reduced, but not easily retained in place; cast six months, to be reapplied if necessary.

20. Girl of three and one-half; left hip; reduced with great difficulty; good acetabulum; six months.

The operations, of course, are performed under an anesthetic. The patient suffers scarcely any pain and after a few days can get about with crutches, using the leg below the knee. A glance at the annexed x-ray photograph will show how complete the diagnosis may be by this method. Even the condition of the rim of the acetabulum may be frequently ascertained, and a fair prognosis made as to the probable value of the operation.

CONGENITAL DISLOCATION OF THE FEMUR. OPERATED ON BY PROFESSOR LORENZ.

14. Boy of three and one-half; left hip; no difficulty; acetabulum good; six months.

15. Girl of three; left hip; easily reduced; six months.

16. Girl of five; right hip; no difficulty; good acetabulum; six months.

17. Girl of four; right hip; easy; six months.

18. Girl of three; double dislocation; the right easy, acetabulum flat; the left hard, acetabulum deep; six months.

19. Girl of eight; left hip; difficult to retain the head in the acetabulum; six months.

The results of this treatment depend very largely upon the condition of the acetabulum. If the acetabulum is deep and its margin distinct, perfect results may be expected. In all cases the leg is extended to more nearly its normal length. Cases older than eight or nine years usually require progressive treatment, namely, stretching the muscles and tendons, traction, tenotomy, etc., as it is usually impossible to complete the reduction successfully at a single operation.

21. Wry neck. The sterno-cleido-mastoideus was "cut" with the hand by a sawing motion, and forcible extension made. This proved insufficient, and the sternal tendon was cut subcutaneously in order to secure sufficient extension. A plaster cast was then placed over the crown passing behind the shoulder of the affected side and around under the axilla of the opposite side. This is to remain three months, to be followed by full passive motion 100 times per day for thirty days.

Prof. Lorenz declined to operate on a number of cases. For instance, on a girl of nine, because the distance from the acetabulum to the head of the femur was too great to enable the reduction to be accomplished at one operation; on a girl of ten, partly for the same reason and partly on account of her age; on a girl of eleven, because the dislocation appeared to be of tubercular origin. In the latter case he recommended slow extension with fixation by a plaster cast for two weeks, to be followed by further extension and fixation.

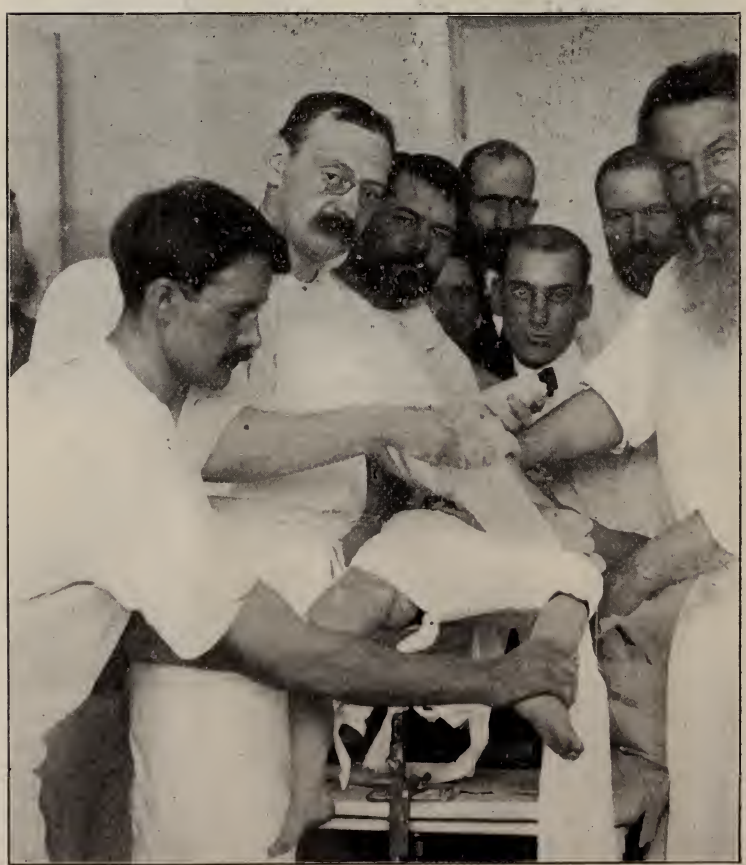
I have also applied the rays recently in a number of cases of diseased bones and sinuses, with very gratifying results. The work of application has been done by Drs. Fox, Brandt, Potts and Dye. To illustrate the value of the ray in such cases I append some brief reports:

1. Tuberculosis of dorsal vertebræ. Patient paraplegic; no control or knowledge of movement of fœces or urine. Has received twenty-six x-ray treatments of ten minutes each on alternate days, from a tube of medium vacuum, as in all the following cases. The discharge ceased after twenty-one treatments. Sensation has partially returned. The patient is now conscious when movement of bowels or bladder is about to occur.

CONGENITAL DISLOCATION. OPERATED ON BY PROF. LORENZ.

2. Osteomyelitis of the dorsal vertebræ, of tubercular origin. Several small abscesses were aspirated, but only staphylococci were found in the cultures. The patient had no control over his legs. He received twenty-one x-ray treatments of ten minutes each on alternate days. He could soon move his limbs. Sensation returned completely, and his condition improved so much that he left the hospital and went to the country. One day while out hunting

STRETCHING THE ADDUCTORS.



APPLYING THE PLASTER CAST.

he accidently shot his left foot, tearing the extensor longus digitorum so that it had to be removed, and tearing open the ankle joint. He returned to the hospital the second day after this accident. I repaired the wounds as well as possible, but later found that infection of the joint had taken place. He was given x-ray treatments on alternative days, for ten minutes each and the wound was covered with a dressing of formalin, one to four thousand. In three weeks he had received eight x-ray treatments. The pus had all disappeared and the joint was perfectly healed with the exception of two small granulating points on the surface. The motion of the ankle joint was perfect.

3. Three spinal sinuses; two opening from the hip, and one behind near the sacrum. The leg was contracted on the thigh. X-rays were given daily, ten minutes on the hip and ten minutes on the back. After twenty-eight treatments the sinuses are much smaller and the patient has gained in weight.

4. Post-peritoneal sinus. A tube was passed thru from front to back and much pus evacuated. The appendix, which was adherent to the parietal layer of the peritoneum, was removed. He received seventeen x-ray treatments, on alternate days at first and later daily, ten minutes in front and ten minutes behind. The drainage tube was removed ten days ago. The posterior sinus is now completely closed, and the anterior is only two inches deep.

5. Abscesses of the neck with three fistulous openings. I curetted this, finding only streptococci in the cultures. After eighteen x-ray treatments of ten minutes each on alternate days the fistulæ were entirely closed.

6. Tuberculosis of the wrist, which was swollen, red and painful. On aspiration, yellow sterile pus was obtained. Injection of ten per cent iodin and two per cent formalin in glycerin was given. Thirteen x-ray treatments have been given on alternate days. There is now no redness and much of the swelling is reduced. Motion of the joint is partly secured, and there is little pain even on motion.

7. Carcinoma of the stomach. The patient has received forty or more x-ray treatments, daily, of ten to fifteen minutes each. The tumor has decreased in size and softened, and the patient is gaining in weight.

8. Carcinoma of the liver. The liver, which was of immense size, seemed scarcely affected by fifteen x-ray treatments, tho the patient's general health improved. He left the hospital for unknown reasons.

9. Recurrent carcinoma of axilla, after extirpation of the breast. After ten x-ray treatments on alternating days the large mass has softened and decreased in size, and there is much less pain.

10. Psoas abscess, fistulæ before and behind. The patient has received forty-two x-ray treatments, daily, ten minutes behind and five in front. The sinuses are closing, the discharge is less, and patient's health better.

11. Lupoid ulcer of the neck. After sixteen x-ray treatments of five minutes each, on alternate days, the discharge was less and ulcer smaller. The patient left for unknown reasons.

BORDER LINES IN RADIOTHERAPY.

BY DR. HEBER ROBARTS.

ST. LOUIS, MO.

Late Editor and Proprietor of the American X-Ray Journal, Ex-President Roentgen-Ray Society of America, Member Roentgen Society of London, etc., etc.

During the last half decade we have been able to cause a change from a diseased condition to one favorable to health in certain inoperable cases, and also in some cases that resist the uses of medicine. Radiant matter effects these changes. When a machine is in working order for x-ray work it requires but very little learning on the part of the beginner to move the handle of the rheostat and with the fluoroscope see the bones of the hand.

At this point there is no material difference in the enthusiasm of untutored operators, and either coil or static machine meets every expectation. At this point however, for proper work, knowledge of the mechanical action of the apparatus becomes important. Some knowledge of physics is required, and the technical uses of both machines should be known by every doctor who does raying. It has been my lot to have had experience with these machines working with several patterns of each kind since 1896. Speaking from my experience the coil will benignly affect the tissues in any case in which the static machine will act benignly, and conversely. But there is a difference. In all open diseases of the skin amenable to the rays, the static machine is the more convenient, when wear and tear is considered, is equally effective, and has less tendency to do injury to adjacent structures. The coil has some advantage on account of construction and also for the treatment of diseases beneath the skin. The lines of force can be increased, not only in penetration, but in number.

The curative properties of raying are limited. Irradiation is unlimited. The young doctor consults his materia medica and uses much medicine: the young radiotherapist, whatsoever his age in doctoring, exults in the early fruits of raying. Experience teaches moderation. We are not in possession of a cure-all. The borderlines in radio-therapy are in parallel with medico-therapy. There are few diseases which when properly medicated, do not make apparent improvement. All the diseases selected for the x-rays offer apparent hope.

Cancers are born of man. They are influenced by a pre-natal condition. The proliferation is atypical. The cause has probably come down thru the early parents from an unknown period, or it is a typical mark of an undiscovered wherefore of the survival of the fittest. The cells of carcinoma are impaired under the Roentgen light and its rays therefore counteract the proliferation. Healthy granulations spring up, as in any clean wound. Scar tissue is generally absent in the healing process. If present, raying at a later time will cause its disappearance without injury to the more resisting healthy tissues. Malignant disease has less tendency to return when removed by irradiation than when removed with the knife. With arsenic or any of the so-called pastes I have failed to see any cancer removed. Instead of staying the disease it really assists the proliferating process. A larger area is included in x-ray treatment, both in depth and surface, than is done with the knife, and this explains why the immunity from return is greater with raying. But the tendency to return is always present. It was before the treatment, and so after the treatment the same factors are present, with this exception, that there has been an awakening, a general regeneration of cell life.

The advantage we have over all previous methods of treatment is that we have not removed healthy structures, and repair has filled in much that disease had removed.

So it is when the disease returns it is less virile and requires less attention in its second so-called cure. This applies equally to cancers of orificial organs when insulated specula are admissible.

These are the border lines in radiotherapy of surface cancers.

Deep cancers and those beneath the skin are greatly influenced with raying. Cancers of the breast for instance, when the integument is unbroken, give hope if treated before much tissue is involved or before the cancer is large. Much time should be given in the course of treatment in order that the avenues for absorption may not be overtaxed. Pain subsides in all cases. The mass slowly shrinks and

loses its tenderness. As a rule four weeks will accomplish much local change. At this time if the mass is large or the treatment hurried, the patient instead of gaining, loses. The color is not so good as before the treatment. The pulse rises in frequency and some fever persists. The patient is languid, irritable, worried, and distress is seen in the face. The skin becomes sallow. There may or may not be small, swollen glands at remote parts of the body. The appetite is gone, the patient enfeebles more and more, and dies. The cause of death was primarily too much raying. Under such conditions the material for absorption is increased and the disintegrated tissues are hurried into the system. The toxemic state is pronounced in such cases. The kidneys are burdened with the elimination of albumose. Natural resistance in the organism is so impaired that the toxic products have a favorable soil. When properly treated, internal cancers are x-rayed for about two weeks for the purpose of deep asepsis, for stimulating cell activity and local anæsthesia. The case is then surgical, and the tumor should be removed without reference to neighboring lymphatics. Two weeks after the operation, raying should again be done in order that any remaining disease may be removed. Recurrence of disease calls for raying, not cutting. This applies alike to malignant disease of the pelvic, abdominal and thoracic organs. This is briefly the border line in radio-therapy of all carcinomas beneath the skin.

There is nothing gained in burning the skin with the x-rays for the treatment of any internal trouble. In fact even a hyperemic state created by the rays will often retard the so-called cure. In all cases of disease, benign and malignant, whether deep or on the surface, the parts should be gone over with some antiseptic fluid immediately before each irradiation. This will partially insure against extraneous contamination. When surgery is not practicable for the removal of internal growths, the light should be penetrating, and the lines of force urged to the fullest possible extent. But the applications should be intermittent. Too hasty absorption of the debris poisons the body. Time must be given for nature's forces to compensate. It is better to keep the patient improving slowly even if two years are necessary to accomplish the desired end.

There are about 100 named diseases that yield favorably to raying:

Neuralgia of the supra-orbital nerve is readily relieved, and cures are almost certain in the chronic types of the disease. The coil is a most effectual machine for the relief of neuralgia, reasons for which have been given. The static machine does good work. I have used of late the 24 plate machine of Betz & Co. and have had most satisfactory results.

In the benign affections, as favus, psoriasis, acne, eczema, rosacea, prurigo, and for hypertrichosis there is no special reason for the return of the previous condition. The border-line in radio-therapy is here well defined.

In some conditions of the eyes the oculist finds great benefit in the uses of the x-rays. Nystagmus is relieved. Some retinal and neural troubles are benefited to a marked degree. In selected cases the sight is improved and younger glasses are worn or discarded altogether.

The annoying forms of diseased prostates yield promptly to raying. Ovarian pains vanish under the influence of the rays. When the causes herein mentioned are primary or contributing elements, the sexual functions are ultimately improved.

Neuralgia of the heart yields to the x-rays, and intercostal pains subside under the same energy.

Migraine of every form, and insomnia, find ready relief under penetrating rays.

Lupus of the moist variety is well adapted for the Roentgen light. They are

beautiful cases with which to lead on the enthusiast. Nodules promptly disappear. Up to the present time most of these cases have been treated surgically, and scar tissue prevails. This also fast fades away. A beautiful, smooth skin soon covers the part. Within two years, approximately, vessels very near the surface course over the previously diseased parts. This is intimation of what is fast approaching. About one-fourth the time spent in giving relief at first is now necessary for the reappearance. Dry lupus, so called, requires more care and will return, in many instances, time and again. In the treatment of this variety rapid effect should be sought. The parts should be blistered within one week. On the first reappearance of a dry scale, irradiate again to the point of blistering. In these cases the part affected is all that is necessary to expose. And here again the border-line in radio-therapy is well established.

The border lines in radio-therapy are no more distinctly defined than in medicine. A physician with knowledge of both will applaud each equally. Their respective usefulness differs. The Crookes tube divested of all hypocrisy, that is, of all appreciable electro-static currents, sends out independent currents or lines of force that are the agents of repair. Improperly used they do harm, but properly used they do good. Every practitioner will fix the border lines in radio-therapy, in the same manner as he fixes the limitations in his practice with other therapeutic agents.

The October number of the "Era," formerly the official organ of the Chicago Electro-Medical Society, attributed to Dr. H. P. Pratt certain statements regarding Drs. Snow, Morton and Skinner. No such statements were made by Dr. Pratt at that meeting.

T. P. Hall, M. D.,
Sec. Chicago Electro-Medical Society.

Practical X-Ray Diagnosis.

Prepared by J. Rudis-Jicinsky, A. M., M. D., M. E. Cedar Rapids, Ia. Revised by M. U. Dr. Joseph Hoffman, Vienna, Austria.

A series of A B C teaching for workers in x-ray diagnosis and therapeutics, to be concluded in 20 lessons. Fully illustrated.

LESSON 17.

Foreign Objects in the Body.

The ease with which the x-rays pass thru the different materials seems to be learned by experiment and by experience. It is doubtful whether any material will absolutely stop the rays, but thick sheet lead seems to offer the greatest obstacle yet discovered, and we use the lead for protection of our hands or face during x-ray work or in radiotherapy, to prevent so-called x-ray burns. Paraffin, wax, vaseline, etc., will not prevent dermatitis or necrobiosis; and we have to be on guard in our examinations and treatments, remembering that x-ray effects on the tissues may be produced with a static machine or coil equally well, thru any substances which are not opaque to the rays. A book of a thousand pages does not obstruct the x-ray to any noticeable extent. It is the same with wood. The soft tissues of the human body give us shadows differing from those of bone, lead, iron or any other metal, glass, etc., which are opaque to the x-ray in ratio to their density; while wood, leather, paper, water, tissue, carbon, etc., are transparent; that is, offer practically no obstacle to the passage of the ray.

Every experimenter by this time has found out for himself that the visible effect of the x-ray, whether in its action on a sensitive plate, film, or paper, or in its visual effect on the fluorescent screen, is a shadow, and shadow only, with all the limitations which the term implies.

In x-ray examinations we have also details, which have to be observed, too. A change in the position of the patient is marked by little change in the general outlines of the shadow of the subject,

while the shadow of the object inclosed in the tissues is greatly distorted, thus producing a distortion in the picture which adds a great element of uncertainty as to the exact location of the object sought, with reference to any points on the subject. Then again there is the distortion caused by the angle of the rays. Thus it has happened in many cases that while apparently a bullet or needle, for instance, was located in a certain position with reference to the anatomy, as shown by a skiagraph, it would be found that it was not at the place indicated. Then the operator blamed the rays, blamed the tube, apparatus, or what not. It is not necessary to enlarge upon this branch of the distortion, for it is familiar not only to every experimenter with the Roentgen rays, but to every surgeon who has made a simple skiagraph the basis of exploration. If we take all this into consideration, we at once have to grasp the inestimable value of an apparatus which corrects this distortion and gives to the surgeon (who knows the difficulty of cutting into the flesh in search of a concealed object or foreign body like a bullet, needle or a piece of glass) a proper measurement and a verified picture.

In military surgery the x-ray has shown what it can do, and there a portable apparatus to generate the rays is the best means to make an exact diagnosis of the existence of a foreign body in every individual case, preliminary to the operation, to determine its presence, and with the help of a fluorometer, its exact locality. The location of a bullet without the x-ray in many cases proved to be impossible, and without the x-ray abnormal concretions, as cystin in the bladder, calculi in the kidney, in the ureters, calculi in the gall-bladder, calcareous deposits in the lungs, at the valves of the heart, etc., could not be made out in the usual way at once, and on the spot.

In all such cases, where the operation was not justifiable, altho some symptoms were pointing to certain lesions, the x-ray settled the doubt, and showed the foreign body even behind bones or deep in other tissues, when two or more views were taken with the fluorometer at a certain angle. The probe in such cases is not only useless but dangerous. By means of the ray every foreign body can be easily detected, and an operation may be performed to relieve the condition at once without any discomfort to the patient during examination. But remember that the plate of the fluoroscope, the screen, or flexible screen, has to be closely against the part examined; and in skiagraphy the foreign body, calculus, deposits, etc., must be as near as possible to the sensitive film of the plate. If the wound of entrance is anterior, examine your patient posteriorly first, and vice versa; if we are looking for hepatic calculi put your patient face down with the gall bladder as near as possible to the dry-plate, and make not only one but several exposures. The same plan is taken with vesical calculi. Stones in the kidneys are better taken when the patient lies on his back directly on the plate. Care must be taken not to illuminate a greater part of the body than appears absolutely necessary to bring the entire plate used under exposure, and especially so if we are after foreign bodies imbedded deeply in thick tissues. Calculi or other concretions along the urinary canal show very well, and beautiful skiagraphs full of truth and proper diagnostic contrast can be made, if we do not forget to bring them as near as possible to the dry plate.

We have examined 204 cases for calculus in the kidney, and found in 99 cases the stones in the ureters. In 10 cases the expectant line of treatment was followed, and the patients passed the calculi, containing cystin especially. The accuracy and value of the skiagraph—not the fluoroscope—in each case, both in locating the

concretions along the urinary tract, and as a guide at the time of operation, can not be disputed. It was not necessary to cut down on the kidney; the skiagraph gave us exactly the place to make our incision.

Minute calculi or concretions, especially of cystin, are seen in children or thin persons on fluoroscopic examinations, but not in every case. As to the accuracy of the negative diagnosis by this method, our diagnosis has been found incorrect in only 4 cases out of 204, and in these it seemed to us that we had not been careful to avoid the superposition of calculus shadow over that of bones, and that the rays were not sent obliquely thru the pelvic outlet, as should have been done. Such plates have to be developed with special care, so that the calculus, giving additional density over the bones, may show. The plate must be always high enough, so that the shadow of a calculus would not be cast above it. The calculi will be found in children more often than we might suppose, and the importance of surgical interference is often shown only by the new method of proper diagnosis, the application of the x-ray.

Vesical calculi may occur singly or in great numbers, and vary greatly in size. Their most common constituents are phosphates. uric acid, urates, calcium oxalate, xanthin, cystin, or various combinations of these. Solid masses of fibrin, and blood sometimes occur in the bladder, and strange to say, may give us a shadow on the photographic plate with many details in the negative, especially if they form nuclei for the deposit of urinary salts.

Biliary calculi show very plainly, especially those containing phosphates, or other mineral salts; those of cholesterin are found with difficulty.

Bullets, needles, pins, all metallic objects, glass, etc., give decided shadows on fluoroscopic examination. In skiagraphy they show always, and appear black in the positive, and white in the negative. In this way bullets, needles, etc., firmly wedged between two or more bones, deep in the tissue, and in a position almost impossible to be detected by the aid of the probe, will always be found, and the case properly diagnosed. The relations of density for comparison in such cases are clearly indicated in Figure 1, a normal adult foot in shoe, showing that no more valuable means of diagnosis has ever been afforded to the science of medicine and surgery.

It has been found by Thompson in this country, and others abroad, that two x-ray shadows, made with the source of x-ray in slightly different positions, may, if viewed under proper conditions, give the effect of a stereoscopic image, and show the depth and true space relations of the object; and that divergence of rays may be corrected with a fluorometer, giving proper cross section at right angles, the object sought being found at the intersection of the horizontal and perpendicular lines given by this very simple apparatus. In this way the localization is made perfect, and the diagnosis in every case must be correct. It is true that there are other methods of localization, but the fluorometer is very convenient for this kind of work.

If we wish to detect a foreign object in any part of the human body, the part to be exposed is placed on the table of the fluorometer with the dry plate under later on. The x-ray apparatus must be in order, and the Crookes tube in position. In the groove of the table we place the cross pieces—already described—the first one about six inches from the front of the table, leaving room to place the frame for holding the grate, when required. Then we select the angle plate or piece suitable to use, viz., according to size of the body to be examined, placing the same in the slot of the cross pieces. With the tube at a certain distance from the part of the body exposed, adjust it, put in ac-

tion, and at its best, see that the arms of the fluorometer cast but a single shadow upon the field of the fluoroscope, then move the limb or body until the shadow of the object or fragments of the bones in fracture, etc., sought, are brought to the shadow of the now coincident arms of the fluorometer appliance. The operator will here observe that if the limb or body were severed at this point the object would be found in the indicated cross section. At this point place one of the sights on the arm of the fluorometer nearest the take the straight connected instrument, and place it over the arms of the fluorometer to ascertain the distance from either of the two points. Place the tube under the aperture in the table, at a safe distance, and repeat the same procedure, and mark the final position with silver nitrate, etc., as before, on the cross section as indicated. The object sought will be found at the intersection of the horizontal and perpendicular lines. The markings have to correspond exactly with the fluorometric measurements.

observer, so that the shadow of the object sought will be seen in the angle of the sight, and the other sight on the other arm of the fluorometer. These two sights show as one in the fluoroscope. Then the grating is placed in the frame, and our fluoroscope used as much as necessary to observe the shadow of the object sought, which has to be parallel with the base of the fluorometer, and consequently the top of the table. Mark this point on the limb or body, at right angles on each side, and

Without a fluorometer how easily an error could be made!

The following case illustrates the usefulness of the x-ray on one side and the danger of a mistake on the other.

"Joseph J. B., aged thirty-nine years, sunstroke six years ago. Since that time had complained of dull, persistent headache on the left side of the head; changed disposition, was irritable, had vertigo, dyspepsia, vomiting, soon followed by slight palsies, but no convulsions. Lately, reten-

tion of urine and symptoms more obscure. The tone of the muscles and intellect were unimpaired.

"Patient brought to me for x-ray examination. With the parts of the head not examined covered with stanniol and those exposed shaved and oiled, I made about six skiagraphs. The first one revealed nothing special, but the last one showed plainly, under the parietal bone at the sagital suture on the left a large epidural clot. The clot amounting to four ounces, was removed, and recovery followed in three weeks without any complication. Spark used, twelve inches; distance of the tube from the object, ten inches; plate right behind; duration of exposure five seconds; angle at which the picture was taken, 36°; plate of tungstate of calcium over the dry plate to shorten the exposure; Wehnelt interrupter used. Patient in elevated position; head low down."

This experience in one case shows plainly the necessity of taking more than one skiagraph in different positions. The first picture was negative and pointed to a non-operative line of treatment together with the obscure symptoms; the last one gave us altogether different view of the status. I would not advocate giving up any of our methods of making diagnosis, but think that the application of the x-ray will be considered appropriate to confirm our diagnosis with all the evidence in each case, which may be procured for the benefit of our patient.

Probably the most dangerous element in the use of the rays is that it is falling into the hands of unprincipled practitioners and quacks, who quote in their glib and inaccurate fashion radiotherapists of known repute. In this lies the greatest possible danger. Therefore, reports tending to show the true limitations of x-ray therapy are now of the utmost importance. —*Interstate Med. Journal.*

ANNOUNCEMENT.

The next meeting of the American Roentgen Ray Society will be held at the Sherman House, corner of Randolph and Clark streets, Chicago, on December the 10th and 11th, 1902.

A special rate of a fare and a third has been arranged from most of the Passenger Associations, on the certificate plan. Members will pay one full fare and must ask for and get a standard certificate, not a receipt, for the same from the agent. When this receipt is vised by the proper authorities it will entitle the member to a return ticket at one-third fare.

A most excellent program has been prepared covering nearly the entire field of application of the Roentgen Rays, and by leading men, some of them very distinguished and widely known. The program cannot be published yet, because all have not been able to submit copies of their papers to the Executive Committee for approval as required by the rules of the Society. This, however, will guarantee that only excellent papers, of which we have at present about twenty, will get before the Society.

The meeting will be called to order promptly at 9:30 A. M., December the 10th, because of the heavy program, and all members are urged to be present promptly at that hour.

A most excellent exhibit by the leading manufacturers has been arranged for, to be held at the same place.

We have assurances that make us sanguine that this meeting will mark an epoch in the history of this line of work.

The constitution as adopted at the last meeting is printed below and we call attention particularly to Article 3, regarding membership.

Weston A. Price,
Chairman Exec. Com.,
Cleveland, O.

CONSTITUTION.

ARTICLE I.

Name: This society shall be known as the American Roentgen Ray Society.

ARTICLE II.

Object: The object of the society shall be the study and practical application of the Roentgen Rays.

ARTICLE III.

Section 1. Its members shall be active, corresponding and honorary, and shall be persons interested in the object of the society, recommended by at least two members in writing, and approved by the executive committee, who must have proof of their good ethical standing. They shall be elected by ballot.

Section 2. Active members shall be residents of America, shall sign the Constitution and pay annual dues of five dollars ($5.00).

Section 3. No member who is in arrears for annual dues shall vote or hold office. Any member in arrears for more than two years, and duly notified by the treasurer by registered letter, shall forfeit membership.

Section 4. Corresponding members shall be residents of foreign countries.

Section 5. Honorary members shall be persons who have distinguished themselves in Roentgen Ray research or practical work.

Section 6. Corresponding and honorary members shall have all the privileges of active members except voting and holding office.

ARTICLE IV.

Officers: The officers shall be a president, five vice-presidents, a secretary, a treasurer and an executive committee of three. The officers shall be elected annually by ballot.

ARTICLE V.

Duties of Officers.

Section 1. The president shall perform all the duties pertaining to that office, and shall deliver an address during the annual meeting.

Section 2. In the absence of the president, one of the vice-presidents shall preside.

Section 3. The secretary shall keep, or cause to be kept, a correct record of all transactions of the society in a permanent form. He shall send due notice of all meetings to each member, shall notify all members of committees of their appointment and of the duties assigned to them. He shall conduct the correspondence and perform all duties usually pertaining to his office.

Section 4. The treasurer shall receive and be accountable for all money that shall come into his hands by virtue of his office. He shall give good and sufficient bond to the executive committee for the safe keeping and disposal of his trust, and shall make a full report to the society annually. He shall pay out money only by the written approval of the president and chairman of the executive committee.

Section 5. An Executive Committee of three members shall be elected as follows: One for three years, one for two years, and one for one year; thereafter one annually to serve for three years. They shall hold the bond of the treasurer, audit his accounts annually, arrange for annual meetings, and have general supervision of the affairs of the society not otherwise provided for.

ARTICLE VI.

Meetings: The annual meeting shall be held on the Wednesday following the second Tuesday of December of each year unless otherwise arranged by the executive committee.

ARTICLE VII.

A Committee on Publication consisting of five members, of which the president and secretary shall be members, shall be appointed annually by the president.

ARTICLE VIII.

This Constitution may be amended by a three-fourths vote of all the members present at an annual meeting, providing

the proposed amendment has been read before the society at least one day previously, and the hour for action has been set by the society and announced in the open meetings for at least one day previously.

Chicago Electro-Medical Society.

The 15th regular meeting of the Chicago Electro-Medical Society was held in room 912 Masonic Temple, Wednesday evening, October 29th, 1902. After reading of the minutes, the chairman announced that Dr. Blackmarr and Dr. Pettyjohn, who had expected to be present and read papers, had been unavoidably detained, and would offer their papers at the next meeting. Some amendments to the by-laws proposed at the last regular meeting were adopted unanimously.

By-law No. 1 fixes the regular meeting for the fourth Wednesday of each month, unless otherwise ordered by the executive committee. In accordance with this the next regular meeting will be held in room 912 Masonic Temple, Wednesday, November 26th, at 8 p. m. This is the Annual meeting for the election of officers and standing committees.

The following new members were elected: Dr. Chas. L. Nichols, Dr. E. G. Trowbridge, Dr. Frank Duncan, Dr. R. W. Bishop, Dr. Hamilton B. Forline.

Dr. H. P. Pratt, chairman of the executive committee, reported that an attorney had been retained by the committee in the interest of the Society. It had transpired that three members of the Society, Dr. G. G. Burdick, Dr. R. H. Street, and Prof. C. H. Treadwell, had, without any authority, obtained from the State a charter for a "Chicago Electro-Medical Society"; in consequence of which the request of the authorized committee for a charter for the Society was refused.

Dr. T. P. Hall read a paper entitled "To What Extent do the Laws of the Electric Current Apply to Electrical Radiations," which follows.

To What Extent Do the Laws of the Electric Current Apply to Electrical Radiations?

We are all familiar with the fact that an electric current cannot exist unless there is a complete circuit. This is one of the fundamental laws of the current. It is recognized as holding true for alternating as well as for steady currents. The question now is, is it also true for electrical radiations, namely, Hertzian waves, ordinary light and x-rays.

Inasmuch as it is exceedingly difficult to discuss the characters of electrical radiations without some more definite notion than is usually held as to what constitutes an electric current, and since the old idea of electricity being the flow of one or more ethereal fluids was long ago proved untenable, I will for the sake of clearness describe briefly the view of the electric current that seems to me most nearly in accord with all the facts we now know, namely the Vortex Theory of electricity and magnetism. According to this view an electric circuit consists of a closed chain of atoms, or rather a bundle of such closed chains. A steady current is a continuous rotation of the atoms forming these chains, the atoms being so held together that one cannot rotate unless all the rest in that chain rotate at the same time and at the same rate. By "current" we then understand the total number of turns per second made by the atoms in these chains. A conductor is a substance which permits its atoms to turn freely under the application of a twisting force (electromotive force). Conductors must then usually be malleable and ductile. In most brittle substances, such as glass and rosin, the atoms are so held together that they can be turned only a little way, and when the twisting force is removed their own elasticity brings them back immediately to their former position. If the twisting force is great enough to compel the atoms to turn completely round, the

glass or other non-conductor will be broken or pierced.

In a conductor we may have either continuous rotation of the atoms, which is a direct current; or rotations in opposite directions, forming an alternating current. When alternations are very rapid, and when the amount of rotation of each atom is very small, the alternating current becomes a wave, which is capable of passing thru non-conductors more easily than thru conductors, and obeys most of the laws of ordinary light.

It is evident on this theory that an electromotive force acting, say in a battery, simply causes rotation in a closed chain of atoms, the force from the battery extending outward in both directions. The force and the turn on one side are right handed or positive, and on the other side left handed, or negative. These terms have reference to the direction in which the observer is looking, and not to the absolute direction of the rotation.

An electrical wave is then a cylindrical rotation of some substance, either atoms or ether. The material surrounding the wave is necessarily displaced at the same time, and its displacement is a slight turn in the opposite direction. If the first mentioned (central) turn is right handed, or positive, the surrounding turn is left handed or negative, and may properly be considered as the return element of this electrical circuit. As the ray advances this circuit lengthens and when the projecting force (electromotive force) is expended, so that the energy of the ray is changed into heat or into any other physical or chemical form of energy, the ray stops. Upon this view then, the law that an electrical circuit must be complete holds true for electrical radiations also.

If we adopt a magnetic theory of the electric current, such as that proposed by my friend Dr. H. P. Pratt, the concept of the return circuit is equally clear. According to Dr. Pratt's view, the atoms form closed chains, as before, attached to each other like little bar magnets; but the electromotive force instead of causing them to rotate gives a push lengthwise along the chain, causing a condensation-wave to proceed in the positive direction and a rarefaction wave in the negative direction along the chain. The two halves of the chain are near together in radiations, one forming a positive and the other a negative ray, and the two necessarily meeting at the extreme limit of the circuit where the electromotive force becomes zero.

Whatever view be taken of the exact nature of the current, the law of the complete circuit can be applied to radiations without difficulty.

The second law which applies to all currents is that the amount of current is the same in every part of the circuit. A good many years ago this law was considered to be true for steady currents only, and it was supposed that alternating currents and particularly those of high potential, such as are obtained from a static machine, do not obey this law. Maxwell was the first to point out that the law is invariably true; and that a non-conductor, with the elasticity of its atoms of which I have already spoken, often becomes part of an alternating circuit; and may become part of a direct circuit in which the current is very small or lasts for only a brief time.

For example, when the jars are on a static machine and connected to the prime conductors, every increase of electromotive force in the conductors makes a turn of the atoms in the jars. All, including those in the glass, are turned a little way; forming a complete electric circuit from the positive prime conductor thru its leyden jar, across by the air or by a metallic or other connection to the outer coat of the negative jar, thru the glass to the negative prime conductor, and across the

discharging rods to the positive pole. No continuous current can exist in this circuit, because the atoms in the glass can not be turned very far without breaking their connection with each other; i. e., without piercing the glass. With each decrease in the potential of the prime conductors, which occurs every time a spark passes, the elasticity of the glass acts as a reversed electromotive force, turning the lines of atoms back to their original position. Thus we get in the lower circuit, which consists partly of conductors and partly of non-conductors, an alternating current.

In radiations, when a large number of rays are crowded together, we may readily suppose, and in fact the principle of the distribution of energy compels us to suppose, that the diameter of that part of the non-conductor which is negatively turned and which lies between the positive rays must be on the average the same as the diameter of the positive ray, in which case the negative turn would in every case be equal to the positive turn, and consequently in every cross section of the radiation the positive and negative rays would be equal in amount. The law as thus stated is not quite identical with the law for other forms of electric currents, but it is at any rate analogous.

Ohm's law holds true for steady currents. This law is true also, but in a modified form, for alternating currents. The modifications become necessary on account of the forces of elasticity and inertia, which can not easily be reckoned in terms of the external electromotive force. Similar modifications are required when we come to radiations; for here the resistance to direct currents may be almost infinite, while resistance to small disturbances of wave-like character may be almost zero. Bearing in mind this entirely different application of the word resistance, it is probable that we have for radiations a law analogous to Ohm's.

The dissipation of energy, that is to say, its conversion into other forms, can be calculated for steady currents when the resistance and the current are known. For alternating currents also such a calculation can be made to a close degree of approximation. A similar estimate can be made for radiations, but we are as yet unable to make very precise measurements of this kind.

To sum up, laws of the electrical currents applying to electrical radiations are (1) The completeness of the circuit, (2) a modification of the law of uniformity of the current in the circuit. (3) Something similar to Ohm's law. (4) A similar law for the diffusion of energy.

Discussion at Meeting of the Chicago Electro-Medical Society, Held Wednesday, October 29, 1902.

Dr. Pratt: This is the first time, I think, that any scientific man has accepted the theory of the return circuit. They all think that the x-ray is simply a force that passes right out in space, and when the force has been expended it stops there. They never take into consideration that there is a return, and this is the first expression by anybody in this country or any other country which corroborates partially my original thot in the matter, which was published in Feb., 1896. I do not see how it would be possible to figure otherwise, for if we accept the fact that the x-ray is electrical, we must then assume that it has a return circuit.

I think that as the force passes out it produces a certain impress on the photographic plate. You cannot decompose a photographic plate without bringing about dissociation. That means a decomposition, and the only method of doing it is by introducing an electrical force. I cannot conceive how it is possible to produce an x-ray burn, not only on the surface of the skin, but deep down in the tissues; (and it frequently takes place on the back

of the patient, away from the ray, as well as in front); I do not see how this is possible, unless it is an electrical phenomenon and there is a return circuit. I do not see how we can decompose a barium platino-cyanid screen without admitting that it is electrical. What do you think about it, Doctor?

Dr. Hall: Mr. Chairman, it is now generally admitted by scientists, I think, all the world over, that the x-rays are electrical radiations of some sort, and so in this paper I have simply taken for granted that they belong to that class, and have discussed electrical radiations of a general type, whether they are Hertzian rays, Roentgen rays, or ordinary light rays. I do not wonder at the hesitation of most of the gentlemen present in discussing the paper, because it is one that is rather condensed, and will have to be read in print and thot over before it can be properly discussed. Of course Dr. Pratt is somewhat familiar with the views that have been presented here and he can talk about it off-hand, which the rest of you can hardly be expected to do.

Dr. Pratt: I think this is an excellent paper, and I do not know of any man that is as capable of handling that subject as Dr. Hall. That is the honest truth. Dr. Hall has looked at this thing from all sides, as I know from talking with him. He has refrained from expressing an opinion for almost a year, a whole year. He has been experimenting, and now I think that he has come to the end of the string and knows exactly where he is. I think he understands it thoroly. That is my opinion. As to how the ray gets back when it passes out, of course my theory may be a trifle different from the doctor's, but it is immaterial either way. We are able to produce photographs of objects often on the back of the plate away from the tube, and we could not do that if it was not for the fact of the return of the electrical force. I think the principle of the x-ray is the same as the wireless telegraphy, which passes out and comes back. There must be a return. The return may be thru the earth or not, but with the next oscillation it comes back again to the point from which it was first started.

CELLULOID SPECULUMS.

In x-ray treatment thru the vagina or rectum a metal speculum nearly always obstructs the rays and interferes with the treatment of some part. Thin celluloid is very transparent to x-rays, and is a very desirable substance for speculums for this purpose. Three years ago Dr. Pratt imported a set of these at a cost of six dollars, but since then the cost has been reduced by a third.

In response to a number of inquiries we are glad to announce that celluloid speculums in sets of four, constructed on the same plan as the Kelley of Baltimore, are now offered by Frank S. Betz & Co., of Chicago, to x-ray workers at a merely nominal price. In fact, Mr. Betz informs us that, under certain conditions, he is giving them away.

SOME ODD EFFECTS OF THE X-RAY.

Kienbock, of Vienna, in experimenting on pigeons with the x-ray, found that the effects on the skin were not immediate, but showed themselves after several days or weeks. Two weeks after the last exposure all the feathers of the back fell out, and later those of the breast, neck and cranium followed suit. The feathers of the wings, side and rump were only slightly affected. The downy feathers and the minute hairs of the skin were also lost.

EDITORIAL.

MEETING OF THE ROENTGEN RAY SOCIETY.

All physicians who are interested in the x-ray should make an extra effort to be present at the coming meeting of the society in Chicago, December 10th and 11th. As indicated in Dr. Price's announcement on another page, the meeting promises to be of unusual interest and importance. Physicians actively engaged in x-ray work will find it to their advantage to join the society and take part in the deliberations. All readers of the Journal are invited to make our office their headquarters during their stay in the city, and to have their mail addressed to our care, 1207 Masonic Temple, Chicago.

Physicians wishing to join the society may send their application with the fee $5 to us, and we will be glad to forward the same to the proper committee. Increasing interest is being taken in this line of work in every part of the country, and we expect a most excellent meeting.

The Chicago Electro-Medical Society not Disbanded.

THE COURT DECIDES IN ITS FAVOR.

A faction of the Chicago Electro-Medical Society, which had been scheming for some months to get control of the society in the interest of some associate members who are dealers in electrical apparatus, attempted to disband the organization at the regular meeting of September 30, 1902. The Electro-Medical Society was organized in June, 1901, and has since then held its meetings regularly, tho a state charter was never applied for. Three members of the society, namely, the president, Dr. G. G. Burdick, the treasurer, Dr. R. H. Street, and Mr. C. H. Treadwell, applied for and obtained a charter for a "Chicago Electro-Medical Society." A resolution declaring that the society should immediately disband was proposed by Mr. Treadwell, without previous notice, at the September meeting, and railroaded thru without discussion by the president, who declared the motion carried and the organization disbanded. The president and all who supported the motion then left the room. A new chairman was appointed, and business proceeded with as before the interruption. The incorporators then made application for a preliminary injunction against the secretary and other members of the society, to prevent them from using the name Chicago Electro-Medical Society. The application was heard by Judge Tuthill last Friday, and after a brief hearing refused. The judge remarked that the applicants, even upon their own showing, had no case, since a motion to disband is necessarily open to discussion, and requires as much notice as a motion to amend the constitution. This practically settles the whole question between the contending parties. The society will now take legal steps to prevent the incorporators from using their charter, and has entertained charges against the disaffected members for conspiracy to defeat the objects of the society. Arrangements have been made to have the discussions in the society taken down in full by a shorthand reporter, since in what was formerly the official journal, a very inaccurate and misleading report of the proceedings of that meeting was published.

THE AMERICAN X-RAY JOURNAL has been made the official organ for five years.

T. P. HALL, M. D.,
Secretary.

SPECIAL NOTICE.

THE AMERICAN X-RAY JOURNAL has been adopted as the official organ of the Chicago Electro-Medical Society, and physicians in and about Chicago who join the society will, on paying their entrance fee of $3, receive the Journal.

TO MEMBERS OF THE ELECTRO-THERAPEUTIC ASSOCIATION.

All persons interested in electro-therapeutics will find it to their advantage to be present, if possible, at the meeting of the Roentgen Ray Society in Chicago, December 10th and 11th. X-ray therapeutics and electro-therapeutics are inseparable. Let the members of the Electro-Therapeutic Association make a strong showing in the Roentgen Ray Society, and their presence will add to the interest and success of the meeting.

X-RAY IN THE TREATMENT OF CANCER.

In the Medical Record of Nov. 1, 1902, Dr. E. H. Grubbe discusses the theory of x-ray treatment and reports seven cases more or less completely cured. He claims to have treated with the x-ray "during the larger part of the past year an average of over 70 patients a day." This is probably a misprint for 17; but even so, the doctor is to be congratulated upon the extent of his work for one who has been at it such a comparatively short time. Dr. Grubbe is mistaken, however, in supposing that he is "doing pioneer work in this line." He appears to be ignorant of the fact that the pioneer work in this direction was done both here and in Europe during the years 1896 and 1897; for he says, "The use of the x-ray as a therapeutic agent is not so new as many would suppose; in fact several x-ray operators have patients now under observation who were discharged symptomatically cured by the x-ray more than two years ago."

Dr. Grubbe favors the view that the action of the x-rays consists of "phagocytosis followed by leucocytolysis." Just what this means is not very clear, but in the next paragraph he explains that "the sum total of its action is that of an irritant." The latter statement is more comprehensible, and represents truly one characteristic feature of the action of the x-rays, the other feature, which he has overlooked, being the acceleration of tissue changes. Speaking of the variety of x-rays produced, he claims that "the variation in quantity and quality of x-rays obtainable with one piece of apparatus is much greater than all the varieties and qualities of tones which may be produced upon the key board of the piano." Most x-ray specialists are of the opposite opinion, namely, that the quantity and particularly the quality of x-rays obtainable from one piece of apparatus is much more limited. Dr. Grubbe says very truly regarding "burns" that they are relatively harmless if not meddled with, but he should add "and if not allowed to become infected."

The success that Dr. Grubbe reports in his treatments must be encouraging to others who, like him, are comparatively new in the work.

CORRESPONDENCE.

Dr. H. P. Pratt:

I thoroly appreciate what I learned in your two days' course and want to take the whole course in the future.

I want to ask you a few questions:

1. What kind of plates are used for photographing?

2. What kind of tube, high or low, for photographing the hand? Body?

3. Time of exposure for hand? Body?

4. Best distance of tube from body when photographing it?

5. Give best speed of machine for photographing?

6. Usual time of developing?

7. Which is best for treating local troubles, such as epitheliomas, a high or low tube? Best distance from tube to body?

8. Which is best for treating cancer of stomach and such internal troubles, a

high or low tube? Best distance from body, and time of exposure?

9. Give your best method of distinguishing a high from a low tube?

—J. W. P.

[1. Use any good negative. Double thickness of film is preferable. See our advertising columns.

2. Use a tube a little lower than can be used to examine the same part with a fluoroscope.

3. The time of exposure depends entirely upon the intensity of the ray, the distance of the tube, the thickness of the part to be photographed and the sensitiveness of the plate. For a 24-plate static machine, a good tube with proper vacuum, distance 10 inches from the hand, probably 10 to 30 seconds. In photographing other parts, increase the time in proportion to the thickness of the part. In varying the distance of the tube from the plate, increase the time in proportion to the square of this distance.

4. Keep the tube so far away that no material distortion occurs in the picture from the dispersion of the rays. Within this limit keep the tube as close as possible.

5. Run the machine fast enough to get good illumination of the tube. 150 to 200 revolutions a minute is usually sufficient.

6. Get this information from your dealer in plates and developing material. Two to ten minutes is customary.

7. Use a tube with such a degree of vacuum that the x-rays penetrate barely thru the part to be treated. Ten inches distance is good to begin with. Vary this as may be necessary to increase or decrease the intensity of the effect.

8. See 7. Greater distance from the body is preferable, to avoid excessive surface action. Expose five to ten minutes at first, and increase this time gradually until the desired effect is produced.

9. Examine your hand with a fluoroscope and note the difference in illumination of the bones and soft tissues. This difference is very marked with a low tube; very slightly marked with a high tube. If there are very few x-rays given off, the bones will appear black and the soft tissues rather dark, whether the tube is high or low.—Editor.]

The Action of the X-Ray and Its Uses in Therapeutics.*

BY WILLIAM BENHAM SNOW, M. D.

The progress of the therapeutics of the x-ray since one year ago will be marked in the history of this association by the fact that at our last meeting no paper was contributed on this now all-absorbing subject. Truly wonderful and well-merited is the progress as shown from the published records of one year. The subject now receives the attention of many of the ablest men in our profession, and has consequently taken hold of the professional mind, in a manner which assures at least its thoro investigation, which is certain to place it in the rank it merits.

The knowledge of first importance to the operator who employs the x-ray for therapeutic purpose is the character of the apparatus and the physiological effect which it has upon the tissues of the patient.

First, we believe that it matters little what is the source of the current which energizes the tube, so long as it excites the character of ray applicable to the case at hand. Experience has already taught the workers in this field, who have done much in the treatment of tumors involving the deeper structures of the body, that the penetrating qualities of the rays is the matter of the first importance. In other words, for the treatment of deep-seated malignant growths tubes of very high vacuum are required, which necessarily call

* Read before the American Electro-Therapeutic Association, September 2, 1902. From the Official Organ.

for an apparatus, either coil or static machine, capable of exciting such tubes. In the writer's experience the apparatus to be preferred for this purpose is a static machine having at least ten revolving plates thirty to thirty-four inches in diameter.

While coils are often capable of exciting high tubes the operation is, as a rule, perilous to the life of both coil and tube. The coils which will energize high tubes daily for a series of cases, rapidly following each other, without serious injury to its parts, are rare; in fact, no coil will excite high tubes without much risk to the tubes, which become high or punctured so rapidly that they are soon out of commission. As good results can be obtained with a static machine, without risk to the machine, and with much less expense and inconvenience, in the matter of tubes. Some of our foreign confrères and the early workers with the x-ray have generally erred in electing a low vacuum tube for therapeutic work. We note, however, a rapid change of sentiment in this particular during the past few months, and it seems now to be an established fact that while tubes of low vacuum are efficient in superficial cases, they are not superior to tubes of high vacuum in the same cases, while they fail utterly in affecting the deep structures to which the high tubes are well adapted.

The action of the rays upon the tissues, healthy, or otherwise, is a subject of unusual interest at this time, and will require much careful study to thoroly establish the exact facts in this particular.

To the rate and character of the vibration of the x-ray is undoubtedly due much of the therapeutic effects derived. Devoid of the heat rays, which are marked by the lesser rates of vibration at the red end of the spectrum, these rays, however, are characterized by marked chemical action upon matter, evidenced in the action upon the sensitized photographic plate and the effects produced upon the tissues.

The characteristic effects upon living tissue following a prolonged exposure or series of short exposures are: (1) induction of impaired nutrition marked by alopecia and atrophy of the cuticle; (2) irritation evidenced by an itching sensation; (3) inflammatory action; marked by tanning, dermatitis, or deep necrosis, the latter followed by sluggish reaction and retarded restoration. The extent of the inflammatory process depends somewhat upon the character of the ray, but particularly upon the length and frequency of exposures and the idiosyncrasy of the patient; (4) the rays destroy some forms of germ life, either by a specific action (which is doubtful); possibly by stimulation and attenuation from overgrowth; or, most probably, by rendering the pabulum unsuitable for their existence. As recently stated by me in a discussion before the Clinical Society of the New York School of Physical Therapeutics, and published in the July number of the *Journal of Advanced Therapeutics,* I believe: (5) that the effect upon normal tissues is first to stimulate normal action, due to the vibratory effects of the rays, or of the ether in the presence of the rays; (6) that short exposures induce activity of normal tissue cells, which, in some cases, supplant abnormal tissue elements, without showing evidence of disintegration; (7) that longer exposures destroy the abnormal tissue elements of low vitality, but do not seriously affect normal tissues unless the exposures are too prolonged; (8) that abnormal tissue elements thus exposed break down and disappear thru the natural channels of absorption, or by sloughing; (9) when tumors of considerable extent are rayed, rarely, if ever, over small tumors, a marked reaction occurs, with fever and varying degrees of prostration, and in a recent case of cancer of the uterus treated by me there was severe diarrhea follow-

ing the sixth exposure. The reaction, in my experience, has occurred on the day following the first exposure, in one case severe, or has been deferred to days following even the sixth exposure. It is likely that the reaction arises from breaking down of devitalized tissue, and auto-infection, which is often marked during the sloughing process.

The results of the tissue changes, as studied microscopically, after a course of x-ray treatment to the present time, are not conclusive. It is hoped, however, that careful investigation in this particular will be made in the future. There are doubtless many effects derived from x-ray exposures upon pathological conditions, which require other explanations than the above actions will include.

While at the present time the x-rays are employed specifically in the treatment of the most intractable types of disease, favorable results have also been obtained in many conditions not associated with malignant disease. In this particular the reports are most encouraging. Basing our therapeutic applications upon the indications shown from the action of the rays, we are led to apply them to all conditions where it is sought to replace unhealthy tissue growth by that which will be normal. Tissue of low vitality, characterized, as it may be, by the presence of some specific process, we repeat, is broken down and destroyed by the x-rays; at the same time, the vitality of the normal tissues is not lowered to a dangerous degree, which makes it possible that normal tissue will supplant the disintegrated neoplasm. In order to facilitate the restorative action to the greatest degree by the reconstruction and replacement of broken-down cells by a healthy new growth, some means which will contribute to the induction of an active and healthy metabolism, is indicated. For this purpose, we believe, for its effect upon superficial structures, there is no other measure equal to the brush discharge, as administered with the wooden electrodes connected with a metallic grounded circuit, the patient being insulated and connected with the negative side of a static machine, the positive side being grounded. The results, uniformly obtained from the employment of the brush discharge, we believe, justify its general adoption in the treatment of all open and ulcerating surfaces, malignant or otherwise.

(10) Another action is suggested by results obtained from its control of pain and hemorrhage, viz., that it causes in the deeper structures, as well as the skin, contraction of the muscular coats of the arterioles, relieving congestion and the consequent pain, as well as diminishing hemorrhage in some diseased conditions, as cancer and fibroid of the uterus.

A study of the action of the x-ray suggests many uses in therapeutics. At the present time, however, there are results constantly arising from its employment not to be accounted for by any definitely explainable action; such effects must be looked upon as results to be studied.

The effects upon the skin suggest its employment in keratitis, acne, elephantiasis in its early stages, removal of superfluous hairs, and all conditions in which it is desirable to induce atrophy of the cuticle and remove neoplasms. Alopecia is, however, but temporary, when induced by the x-ray, unless the process is repeated at intervals until the hair follicles are finally destroyed. Its action upon superficial inflammatory conditions is probably due somewhat to its effect upon metabolism, not unfavorably influencing the normal tissue elements while causing the abnormal elements of low vitality to break down. The two forms of lupus, rodent ulcers, epithelioma, and superficial sarcoma are invariably cured either by the x-ray alone or in conjunction with the brush discharge.

That many other affections of the skin

are satisfactorily treated by the x-ray there is reason to expect.

That malignant growths, wherever situated, may be favorably affected and often cured by this means there is abundant evidence, but to combat the growth and effectually remove every trace of malignancy often taxes the skill and patience of the operator. High tubes, the removal of intervening materials, raying thru open cavities, and the employment of tubes, which may be placed within such cavities, and regulations of frequency and length of exposures, may all contribute to the successful termination of malignant growths, not superficially located.

When tumors beneath the integument or in the closed cavities of the body break down, as they often do, auto-infection, as a rule, occurs, associated with rise of temperature and marked depression. These cases will prove fatal in many debilitated patients. The writer is familiar in his own practice and that of others with cases which have given unquestionable evidence of such infection following, or associated with, sloughing. It is, therefore, a matter of great importance when undertaking the treatment of a case of internal cancer to consider the advisability of having the bulk, if not the whole, of the malignant growth removed after a short period of raying and thus prevent the danger, possible to arise from auto-infection and at the same time increase the patient's chances of recovery.

The advisability of operation in cases which, without the employment of the x-ray, would be considered inoperable, will offer encouragement for a successful termination in many cases. I have in charge a case in which there was cancer of the uterus and appendages, which was referred by me to Dr. Frank Hartley, and operated upon by him in the New York Hospital, in which an operation would have been useless but for the fact that the x-ray was to be employed after the operation. Unfortunately, in this case, it was impossible to have the x-ray employed at the hospital, and for some time after the patient's dismissal she was unable to make the necessary trips to and from my office. After six weeks, on account of severe hemorrhage, without consulting me she returned to the hospital, but was not admitted, but referred to my office. When the patient came, the vault of the vagina was open and ulcerating, the recto-vaginal septum was indurated, there was a vaginal discharge, which was extremely offensive, and the ulcerated surfaces bled freely. In this case it was deemed best to ray the parts through a speculum. After each treatment the patient was tamponed with iodoform gauze, which was left in position for forty-eight hours. She has continued to come to my office every second day. After the third raying the discharge ceased to be offensive and the hemorrhage had practically ceased. Since the third time she has also been rayed above the pubes, and at present the ulcerated surface appears to be healing, hemorrhage has ceased, the tampons have been abolished, and the patient bids fair to make a recovery.

It seems that this is the rational procedure, which should be followed in all similar cases, operable and inoperable. In the light of present experience we feel justified in saying, no malignant tumor should be operated upon unless it is to be subsequently rayed, and we believe, as well, that raying should precede the operation, at least for a short time, in most cases. At the present time, in the face of surgical history and the scars produced, it is absurd to contemplate any operative procedure whatever upon a superficial epithelioma. In the treatment of both forms of lupus, the x-ray should, we believe, be used, in conjunction with the static-brush discharge. Our plan is

to ray the patch upon alternate days, employing from the first the brush discharge daily.

We have demonstrated that lupus vulgaris may be cured by the use of the brush discharge alone, but undoubtedly the results are greatly hastened when employed in conjunction with the x-ray. On the other hand, in our experience, lupus erythematosus yields so slowly to the brush discharge that it is questionable if it can be cured in many cases without the additional use of the x-ray. After faithful employment of the former for more than six weeks daily, in one case the improvement was but slight; the case was then exposed to the x-ray on alternate days for ten minutes; six exposures were made, when the surface began to slough, and continued to do so. The brush discharge was actively employed as previously, and the whole surface was rapidly healed within one month.

Another case is of lupus erythematosus, of seventeen years' standing, which has been known during that time to the leading dermatological clinics in the city of New York. The patient was rayed on alternate days eight times, beginning on June 16, 1902. The brush discharge was employed daily. The case made a most rapid and uninterrupted improvement. On August 25 it was thought best that another series of raying be instituted. The case is now so greatly improved that but a short period remains to complete the cure.

The effects upon painful conditions of neurotic character are truly wonderful. A case of tic douloureux of eight years' standing, during which time paroxysmal attacks have been constant, was relieved after each exposure and has remained cured for five months after four x-ray exposures at which a tube of high vacuum was employed. Another case of brachial neuritis, involving the plexus within the chest, was greatly relieved, and the cure hastened by exposure to the rays from a high-vacuum tube.

Our experience with acne of the pustular type is confined to two cases, in which the x-ray has again proved most satisfactory. The cases had both been under treatment by specialists for some time, without making any improvement. The x-ray was employed on alternate days until a slight redness appeared, and then discontinued until it disappeared. Raying was then kept up irregularly, watching the ever anticipated dermatitis. The brush discharge was used on the same days that the rays were employed; these cases both made rapid improvement to complete recovery and are now cured.

A case of more than usual interest was one in which tubercular glands had been removed, along the course of Poupart's ligament on the left side. Two weeks after the operation the surrounding tissues were deeply indurated over an area three inches in diameter, and showed no signs of healing. The wound had a cadaverous appearance. The case was referred to me by my assistant, Dr. Grad, in the clinic of the New York School of Physical Therapeutics. The improvement after the third exposure to the x-rays was most remarkable. In this case also, as in all ulcerations and open surfaces, we employed the brush discharge on each day that it was exposed to the x-rays. The rays were employed in this case five times, and the unhealthy wound granulated and healed rapidly.

Laryngeal cancer, we believe, can, as a rule, be favorably treated by applying the rays from a high tube over the larynx. A case which I have treated since April 1 has made slow but progressive improvement, and is now beginning to phonate articulate sounds. The case has been under the observation of several specialists, all of whom pronounce the local conditions markedly improved.

A case of sarcoma of the face, which

was referred to me by Dr. W. B. Coley, has shown most remarkable change, demonstrating very many valuable features of the effects of the x-ray.

A tumor upon the orbit rapidly vanished, and it was demonstrated in this case that the eye is no more susceptible to x-radiance than the skin; (2) that large tumors disappear by sloughing within mucous cavities; (3) that the process of sloughing is associated with rise of temperature and depression; (4) that the greatest progress toward improvement takes place during periods marked by lost appetite and depression, possibly a coincidence; (5) that high-vacuum tubes are indispensable to the treatment of such cases; (6) that with great caution and raying every second day, for ten minutes, may be followed by second degree dermatitis; (7) that patients do not become more tolerant from prolonged treatment; (8) that when the tumor is removed by the rays from one part, it may assert itself with vigor in another location; (9) that malignant tumors beneath the integument will disappear when exposed for a period of time to the x-ray; (10) that long periods of time are essential in some cases to effect a cure or determine a failure.

The field of radiotherapy abounds in great possibilities, and is now but newly entered. Time alone can define the limitations. Earnest study and investigation are demanded; let those who are prepared to enter and those who have entered move on with proper regard to the dangers and possibilities, and we have abundant reason to believe that some of the awful scourges of humanity will be shorn of their terror.

The X-Ray Stereoscope.—Dr. L. A. Weigel of Rochester exhibited this instrument and described it. In using it two exposures are made with the x-ray tube in two different positions with reference to the subject photographed. The distance between these two positions of the x-ray tube should not be much over the distance between a person's eyes, otherwise distortion will result. The two negatives thus obtained are placed in a reflecting stereoscope and combined so as to form a single image, which appears to the observer in relief. This method enabled one to localize more accurately the objects found in skiagraphs.—*Medical Record, Aug.* 9, 1902.

X-Light in the Treatment of Cancer.

BY CLARENCE EDWARD SKINNER, M. D., LL. D., NEW HAVEN, CONN.

(Continued from page 1191.)

We will consider these cases, if you please, in five divisions. The first will include those which have reached a fatal termination; the second will consist of those in which bony tissue is involved; the third, abdominal cases still unfinished; the fourth is a series of mammary cancers; and the fifth is constituted by one case of sarcoma of the neck.

The first group includes nine cases.

CASE I.—Carcinoma. Diagnosis microscopically confirmed; situated originally in the cervix uteri, and recurrent after two operations, the last one being an hysterectomy and ovariotomy. The patient came under treatment December 20, 1901. At this time there was a tumor in the cicatrix in the anterior abdominal wall as large as a small orange, and an ulcer in the vaginal vault and anterior wall, starting from the cicatrix, as large as a silver dollar. Other small tumors were palpable in the abdominal cavity. Patient suffered severe pain constantly; there was profuse bloody purulent discharge from the vagina, and the condition was one of hopeless, helpless misery.

The first x-ray application markedly relieved the pain and soreness, and the patient slept well the night following for

the first time in many weeks. After the fifth treatment patient was able to stand upon her feet for the first time in eight months. After the sixth treatment there was no pain, the large tumor mentioned above had decreased to the size of an English walnut, and the smaller tumors in the abdomen had disappeared, the ulcer in the vagina had decreased to the size of a dime, and the bloody purulent discharge had become only a trace. These promising conditions continued for three weeks, when she began to have the discharge again with small masses of disintegrated tissue. This was accompanied by a temporary accession of pain, a rise in temperature, and slight acceleration of the pulse. These conditions subsided in about ten days, when she was again comfortable for several weeks more. During this time she gained slightly in weight. She then began to show symptoms of general toxæmia, a perforation of the rectum developed, accompanied by absolute intolerance of food on the part of the stomach, and she continued to fail gradually until the latter part of March, when death ended the scene.

During the first two months it seemed probable that an inhibitory and reparative influence was being secured, and there was no evidence at any time of any increase in the size or number of any of the lesions. The patient seemed to be dying slowly of general toxæmia and malnutrition. The only good results attributable to the rays in this case appear to be the relief of pain, whereby she was able to give up her morphine, and a slight prolongation of life.

Case II.—Carcinoma of the cervix uteri, vaginal wall, bladder, and probably other structures, with a perforation into the bladder, so that all urine passed through the vagina. Patient came under treatment January 28, 1902. Pain had been constant and excessive for eight months. A profuse, bloody, purulent discharge had been present during the same time. The patient was only able to sleep under the influence of heavy doses of morphine, was eating scarcely anything, and was wasted to a mere skeleton. After the second treatment pain began to lessen, and after the seventh she was able to give up her morphine and never resumed it again, the rest of her life being almost entirely free from pain. The discharge was noticeably less after the second treatment, and continued to grow less until, at the end of three weeks, it had become but a small stain on the pads. Bloody discoloration occurred only occasionally after the seventh treatment, and the patient slept exceedingly well, ate splendidly, and gained markedly in strength. She continued to gain generally until the latter part of March. At this time her weight had increased four pounds, she was walking about the sanitarium, and felt entirely comfortable. Suddenly she developed uræmic symptoms and failed steadily for ten days thereafter, when she died.

The beneficial results attributable to the rays in this case were the entire relief from pain and the gain in the general strength and condition.

From examination it also appeared that the growth had become smaller on its superior aspect, but had encroached steadily toward the vulva. Several times during the course of the disease she exhibited phenomena of general systemic toxæmia.

Case III.—A scene painter, aged forty-eight. Osteosarcoma of left superior maxilla, starting from a tooth socket from which the tooth had been extracted some two years previously. Came under treatment February 20, 1902. At this time a large portion of the maxilla and palate had sloughed away. There were three sinuses opening exteriorly, two on the cheek and one on the neck below the angle of the inferior maxilla. The discharge was profuse, and horribly fetid. The patient had been unable to leave his bed

for three months; had been eating almost nothing, his weight had reduced from 230 to 140 pounds during the previous six months. He was in constant agonizing pain. Was unable to sleep without opiates and resorted to them constantly. The left side of the face was badly swollen.

His pain disappeared entirely during the first treatment and did not return for eight hours. After the fifth treatment the discharge had lessened about one-third, pain had entirely disappeared, and the patient was taking no more morphine. He had a good appetite, was taking nourishment well, and was sleeping, he said, as well as he ever did in his life. The swelling had been markedly reduced. His strength had increased so that he was having his clothes on an hour or two every day. He continued to improve for a month, when pieces of bone commenced to slough out; coincident with this there appeared a rise of temperature, accompanied by chills and great prostration. During the next month the patient was able to leave his bed and come to the sanitarium for treatment but six times. A month later, in the latter part of May, he died. During the last six weeks of his life masses of bone were constantly sloughing away, the amount of nourishment taken grew less and less, his strength steadily decreased; in short, he appeared to have died from general systemic toxæmia.

The beneficial results attributable to the rays in this case were complete removal of pain, which never returned after the fifth treatment, apparent arrest of the spread of the process, and marked improvement of the general condition during the first month.

Case IV.—Carcinoma of the left breast. A tumor had been removed by some paste preparation two years previously, and this was a recurrence. It had been removed again by the same paste and the sore had failed to heal, for which reason patient was sent to me for x-ray treatment. The tissues removed had been a mass about half the size of a small orange. When she came under treatment the excavation into the breast was about one inch deep with raised, inflamed, indurated borders. The breast was adherent to the ribs and there was considerable involvement of the axillary glands. Pain was constantly present. She came under treatment January 8, and was treated off and on until April 12, at which time she was prostrated by what was diagnosed by the attending physician as at attack of "rheumatism" in the muscles of the back and shoulders, and died in about three weeks.

After the first three treatments she had pain only at intervals until the attack which resulted in her death. The axillary glands had decreased considerably in size, as had also the process in the breast, but at no time had the induration about the edges entirely disappeared, neither was there any sloughing observable. Her general condition, except in so far as relief from pain was concerned, did not seem to be changed at all during the course of the trouble.

There is good reason to believe that her "rheumatism" was due to septic absorption, with general toxæmia sufficiently pronounced to cause her death.

The only good results attributable to the application of the rays in this case were the relief of pain and the apparent arrest of the spread of the local lesions.

Case V.—Sarcoma of the lymphatic glands of the left cervical region under and back of the angle of the jaw. Lesion had originally been sarcoma of the left parotid gland, for which total extirpation had been done. The tumor mass was about two inches in diameter laterally and one and one-half inches vertically. The patient's general condition was good, but he was in more or less constant pain, and the tumor had been increasing rapidly for two months previously. Patient came under treatment February 10, 1902.

For the first month the pain was very much lessened by the treatments, sometimes disappearing absolutely for several days, and the tumor became some softer and smaller. For the next month no change of any sort was discernible. At this time the tumor began to increase, the patient began to lose appetite, grow weaker, and lose flesh, and continued steadily to do so until along in June, when he died from exhaustion.

The beneficial results attributable to the rays in this case were confined to the partial relief of pain and arrest of progress of the growth during the first two months. After this, although the patient was rayed every day for a month, absolutely no beneficial results were discernible.

Case VI.—Sarcoma of the left cervical lymphatics, as large as a small orange, below the angle of the jaw and extending down behind the clavicle into the mediastinum. A persistent right-sided sciatica also indicated that a malignant process was present in the deep abdominal glands, but no tumor was palpable in this situation. Cough, difficulty of swallowing, and loss of appetite were present, and some loss in weight had been observed. Rotation of the head was interfered with. Was sleeping very poorly.

I commenced treating the neck and upper thoracic region every other day on February 21, 1902. By March 4 the tumor had reduced in size so that he could button his shirt collar together, whereas previously the ends would not come closer than three-quarters of an inch. Difficulty in swallowing had grown very much less, and there was very little interference with rotatory movements of the head. He was eating splendidly. From this time until April 19 the growth steadily diminished until it had become discoverable only on deep palpation back of the clavicle, and all of the pressure symptoms had disappeared. His appetite and general condition were excellent.

As the patient desired to attend to some business affairs at his home, I then released him from treatment, telling him to come back at the end of two weeks in order that I might treat the abdominal condition. Late in May I received a letter from his wife, stating that he had suddenly grown very much worse. He entered the sanitarium for resumption of treatment on the 30th of May. At this time he was unable to retain even water on his stomach. He was shockingly emaciated, and the pain in the right sciatic nerve was constant and harassing in the extreme. There was no apparent change in the cervical tumor from the condition observed when he went away, and the present desperate conditions had developed during the previous two weeks. For the next six weeks I applied x-radiance through the anterior abdominal and thoracic walls in such a way as to influence as much as possible the deep lymphatics. In the course of a week the pain in the right leg was much improved and at the end of the second week it was practically gone. He was taking nourishment fairly well, had been able to dispense entirely with morphine, and was feeling much better in every way. He also grew slightly stronger, so much so that he went out driving several times.

On July 17 I sent him into the country, intending to give him a two-weeks' rest from treatment. Five or six days after he began to fail in strength quite rapidly and a week later he died from exhaustion. There was no excessive temperature at the time.

The reduction in size of the cervical portion of the malignant enlargement in this case gives a striking illustration of the possibilities of x-ray therapy, but the ultimate result proved that the agent sometimes encounters insuperable limitations. The relief of the sciatica, increase in the ability to take nourishment, and the slight improvement in the general condition during the last course of treatment are proof

that an influence over the deeper malignant process was exercised, but it was not possible to render it profound enough to secure permanent benefit for the patient.

Case VII.—A rapidly growing fibrocystic sarcoma of uterus of about one year's standing. The transverse diameter was 8½ inches and the tumor extended to a point three inches above the umbilicus. Laparotomy was done, tumor found to be inoperable, and patient sent to me for x-ray applications three weeks afterward. She was treated for five weeks with apparently no result except a diminution of about 1¼ inches in the vertical diameter and 1½ inches in the transverse dimension, and it is open to question as to whether this diminution was due to x-rays or to the cutting off of some of the nutrient vessels by the laparotomy. It is just as likely to have been the latter as the former.

Her stomach developed an almost absolute intolerance of nourishment and she died of exhaustion four weeks later.

Case VIII.—Carcinoma of the uterus of four years' standing, bladder, rectum, and adjacent tissues involved, but no perforation present. Patient was in constant pain and profuse discharge was present.

She came under treatment May 8, 1902, and was treated every day for the next month. The only beneficial effect observable was a considerable diminution of the discharge. On May 26 her temperature went up to 102° F. and for a week thereafter she exhibited marked symptoms of general systemic toxæmia. Her pain was not influenced in the least, and it was necessary to keep her constantly under the influence of large doses of morphine. From the first her general condition grew steadily worse, and she died of exhaustion two months after first coming under treatment.

Case IX.—Carcinoma of the uterus of three years' standing involving deep abdominal lymphatics. Patient came under treatment February 11, 1902, and was treated irregularly for two months thereafter. She then discontinued treatment and died three months later. In this case the pain and the discharge were markedly lessened, but no beneficial effect was observable. She was so irregular in her visits however, that I do not look upon this case as a fair exemplification of the effects of the treatment.

The next group consists of four instances of cancer involving bony structures.

Case X.—Epithelioma of the left orbit involving the nose. Patient was suffering pain constantly and was unable to breathe through the nose. There was at times a profuse bloody discharge from the nose and the eye had been considerably extruded from the socket upwardly and outwardly. The pain was lessened by the first treatment for several hours, and after the third treatment relief from pain was permanent. After five treatments he could breathe through his nose and the tumor was reduced so that the eye had gone back considerably to its normal position. He was under treatment for ten weeks, when he discontinued for some reason unknown to me, and I lost track of the case. The complete cessation of pain and the improvement in the nasal condition indicated that actual improvement was being secured upon the growth itself, and this was confirmed on examination by the specialist who referred the case to me.

Case XI.—Osteosarcoma of the superior maxilla, recurrent after operation. Patient came under treatment May 20, 1902, at which time he was suffering from pain constantly which kept him from sleeping, had little appetite, and had lost some flesh. Up to the present time has been treated about three times a week. Has been practically free from pain since the 1st of June. On July 1 he was taken with chills and fever. This was soon followed by the formation of an abscess,

which evacuated spontaneously into the mouth after a few days. During this time he was prostrated. had repeated chills and fever, and spent most of his time in bed. About eight days later a sinus opened in the neck just below the inferior maxilla, and has discharged at intervals since that time. After recovery from the systemic toxæmia occasioned by the formation of the first abscess his general condition improved. and since then he has been eating well, sleeping well, feeling well, and attending to his business again. The outlook in this case is hopeful.

Case XII.—Patient aged seventy-nine years. Epithelioma affecting the lower jaw, chin, and lower portion of the cheek on each side. Patient was suffering pain constantly. General condition very poor. He has received twenty-three treatments with apparently no beneficial results except a marked amelioration of the pain. His general condition appears to be growing slowly and steadily worse, but I cannot perceive that. the area of the disease has increased at all since he came under treatment.

Case XIII.—Condition almost identical with the above except that the patient was fifty years old instead of seventy-nine. He took three treatments and then discontinued without explanation. No effect was apparent from the three treatments, not even relief from pain.

The results in these cases indicate that, as would be inferred, cancer involving bony tissue responds much less readily to x-ray therapy than when the soft tissues are affected, even though the process may extend deeper in the latter case.

The third group includes nine cases of intra-abodminal cancer.

Case XIV.—Carcinoma of the uterus, involving the vaginal vault and deep abdominal lymphatics, of three years' standing. First came under treatment April 5, 1902. At this time patient suffered pain constantly. Had profuse exceedingly malodorous discharge. General condition poor and rapidly growing worse.

During the following three months she was rayed every other day. She then discontinued treatment. Up to that time there had been spasmodic evidences of improvement in the way of temporary relief of pain, lessening of discharge, etc., but on the whole her condition did not appear to have changed. She was, however, no worse than when treatment was instituted, and an inhibitive influence had apparently been secured upon the malignant process.

Case XV.—Carcinoma of the uterus, also probably involving the deep abdominal lymphatics, of eighteen months' standing. Patient came under treatment February 20, and for the next six weeks received twenty-one treatments. She then discontinued without explanation. In this case no change was observable in either the symptomatic phenomena, the discharge, or the growth itself. As the patient was growing steadily worse when she came under treatment, it is reasonable to suppose that an inhibitory influence was also secured in this case.

Case XVI.—Carcinoma of the uterus, involving bladder and vaginal vault. Patient first came under treatment June 29, 1902, and has received thirty-two treatments. She was growing rapidly worse when she came under treatment, and there have been spasmodic evidences of improvement in the way of lessening of the discharge, cessation of hemorrhage, and relief of pain. Up to the present time these intervals of improvement have not lasted more than four days each, when there has been another accession of sinister phenomena. This patient is still under treatment, hence conclusions as to the ultimate destiny of the case are at the present time impossible.

Case XVII.—Carcinoma of the uterus, involving the vaginal vault and deep abdominal lymphatics. Patient suffered con-

stantly from pain, and had severe hemorrhages every few days. General condition exceedingly poor. From May 8 to May 22 was treated eight times. She then discontinued without explanation. During this time her hemorrhages became very much less, her pain was relieved somewhat, but the time, of course, was too short for her general condition to show much change. I have since heard, however, that some benefit followed the course of treatment which she received.

CASE XVIII.—Rapidly growing carcinoma of the uterus with extensive involvement of contiguous tissues of about two years' standing. Patient suffered intense pain and had severe hemorrhages. General condition very poor. She received three treatments with apparently no effect whatever, and discontinued.

CASE XIX.—Malignant disease of the pyloric end of the stomach in a man sixty-eight years old. First came under treatment February 18, 1902. Was then suffering from constant and excruciating pain, unable to sleep or take nourishment, and his general condition was very poor and rapidly growing worse. After the second treatment he slept all night without any opiate for the first time in many weeks, and the soreness present on deep palpation was much lessened. He has been under treatement about three times a week since that date, and has been able to take judiciously chosen nourishment nearly all that time. Pain steadily lessened until about six weeks ago, since which time it has been practically nil. Soreness upon deep pressure is apparent only in two spots and his general condition is considerably better in every respect than when he came under treatment. The outlook in this case appears to be hopeful.

CASE XX.—Fibro-sarcoma of anterior abdominal wall, recurrent after extirpation of uterus and ovaries for the original growth, which started in the uterus. Diagnosis microscopically confirmed. She first came under x-ray treatment January 28, 1902. At this time the lateral diameter of the tumor was ten inches and the vertical diameter eight inches. Growth had been increasing rapidly for the previous three months, and at this time was of a stony hardness thruout. After the third treatment it was observed that the tumor had become markedly softened in spots, in one place apparently to the depth of an inch or more, and the skin, which before had been firmly fixed to the tumor, had now become movable over a considerable portion of its area. Sensations of pressure and discomfort which were markedly in evidence when she came under treatment had greatly lessened and the patient expressed herself as feeling much better. Since that time she has received eighty-five treatments. There has been a slight diminution in the size of the tumor. Patient has no sensations of discomfort or pressure and feels so well that she is returning to her position as school teacher this month.

In this case the rays have unquestionably inhibited the malignant progress of the tumor up to the present time, and the future history of the case is to be regarded with very great interest. Even if we can not remove these tumors it will be an achievement of inestimable value if we are able in some cases to inhibit further development of the malignant tendencies.

CASE XXI.—A growth in the neighborhood of the left broad ligament, said to be malignant and inoperable by a surgeon who did an exploratory laparotomy, but no microscopical section was made. It was accompanied by ascites, which accumulated rapidly, to the extent of two or three gallons, necessitating frequent tappings. No pain was ever present, but the growth was exquisitely sensitive upon palpation. Patient came under treatment January 27, 1902. Three days after two gallons of fluid were withdrawn from the abdomen through a cannula. During the

next month she was given eleven x-ray treatments. The soreness on palpation was markedly lessened and her general condition improved considerably. She was then tapped again, removing a gallon and a quarter of fluid. Examination after tapping, however, indicated that the growth had encroached upon the right side of the pelvis in a position where it was not evident a month previously. Her weight was 128¾ pounds. x-ray applications were continued about three times a week for the next two months. Fluid did not increase to any great extent during this time. Patient continued to feel better and better generally. She was now able to ride in a carriage without suffering pain from the jolting. Her weight increased to 140½ pounds. Up to the present time she has been rayed on an average of three times a week. The fluid has not reaccumulated. The tumorous mass, as far as examination will show, seems to have decreased in size, and her general health is excellent.

In this instance the inference that the growth and malignant tendencies of the disease have been inhibited, at least up to the present time, seems justified.

Case XXII.—A nodulated palpable tumor, probably sarcomatous, situated deeply in the lower lumbar and upper sacral regions. Patient first came under treatment February 3, 1902. At this time pain was constantly present in the small of the back and in the right sciatic nerve. Tumor was characterized by exquisite tenderness upon deep palpation. Two treatments completely removed the sciatica and markedly lessened the backache. After a dozen applications the pain in the back caused her very little trouble, and the soreness upon palpation was only evident when firm pressure was made. Up to June 7, a period of four months, she received thirty applications of the rays. She was then practically free from pain and the tumors had decreased in size so that they were no longer palpable. At this time she was operated upon for a tubal pregnancy, and the surgeon who operated, and who had referred the patient to me in the first place, informed me that examination of the original malignant mass at the time of operation demonstrated that three nodules about the size of a pea were all that was left of the lesion. The future history of this case is also pregnant with interest.

The fourth group is constituted by a series of ten mammary cancers.

Case XXIII.—Cancer of the right breast. Recurrent after operation, involving the axilla, the supra-clavicular lymphatics, and the pectoralis major muscle. Characteristic pain, following the distribution of the lower lumbar nerves, which had been present for several months and resisted treatment addressed to its relief, also indicated that matastases existed in the deep lymphatics of the trunk. Her general condition was very poor. Emaciation pronounced. Came under treatment first March 26, 1902. Up to the present time she has received sixty treatments directed alternately upon the breast and the deep lymphatics of the trunk through the anterior surface of the body. The enlarged glands in the neighborhood of the clavicle and the mass of pathological tissue in the axilla and the pectoralis major muscle have entirely disappeared. She has had no pain in the back for the last eleven weeks, and her general condition has steadily improved. She has gained ten pounds in the last two months. Present appearances indicate that this woman has been entirely cured of multiple recurrent cancer of considerable extent.

Case XXIV.—Scirrhus of the left breast of two years' standing. The chain of glands leading to the axilla and the axilla itself were extensively involved, forming an oblong mass one inch in diameter and three inches long. Constant cough and bloody expectoration indicated in-

volvement of the bronchial lymphatics. Patient first came under treatment March 22, 1902. Since that time she has had forty-four treatments. The mass in the breast has diminished at least twenty-five per cent. The axillary end of the oblong tumor referred to has receded apparently about three-quarters of an inch, but no change has apparently taken place in the mass of indurated glands at the lower border of the pectoralis major muscle. Cough and expectoration have diminished somewhat, but are still present. The pain, which was constantly present when she first came under treatment, had also diminished considerably.

In this case, which has now been under treatment five months and in which the tumor was growing rapidly when she consulted me first, there has evidently been secured a stay in the progress of the disease, and the decrease in the dimensions of the tumor and the symptoms which indicated bronchial involvement led me to hope that we may be able to carry these results considerably further.

Case XXV.—A malignant process in the right breast, adherent to the ribs with an ulcerated area at the junction of the breast with the trunk, and a slight involvement of the axillary glands. Patient aged 68. First came under treatment June 15, 1902. Since then has had eighteen treatments, with complete healing of the ulceration as a result. The indurated masses in the axilla and in the breast have softened and decreased in size. Pain has been greatly lessened and the patient's general condition has improved.

Case XXVI.—Small hard nodule in the left breast about the size of a walnut, with retraction of the nipple and induration of the axillary glands, of about six months' standing. Patient is sixty-six years of age. First came under treatment May 7, 1902. From that time until June 7 she received fourteen treatments, when a severe x-ray dermatitis developed and it was necessary to suspend applications until August 2, when they were resumed.

At the present time there is no pain in the breast. The nodule has decreased about fifty per cent in size. The axillary enlargement has nearly disappeared, and the patient appears to be progressing toward complete recovery.

Case XXVII.—Epithelioma of the left breast, starting at the nipple, consisting of a horny induration and thickening of the skin in the immediate vicinity, with a mass in the breast about as large as an English walnut, and enlargement of the axillary glands, of ten months' standing.

Patient first came under treatment April 2, 1902, since which time she has received forty applications. Now the axillary enlargement has decreased in size about fifty per cent, and the mass in the breast has decreased in size, but there has been no change in the horny induration of the skin, in spite of the fact that I have twice induced a moderately severe dermatitis. The patient's general condition, which was poor when she first came under treatment, has improved greatly. She now suffers no pain, and it appears reasonable to suppose that we have at least secured a stay in the malignant progress of the disease.

Case XXVIII.—Cancer of right breast, involving the axillary glands. Had had an indurated mass removed from the same breast by a plaster two years previously. First came under treatment March 17, 1902, at which time in addition to the mass in the axilla there were palpable three distinct indurated masses in the breast itself. She has received fifty treatments altogether, and at the present time nothing is discoverable of the axillary enlargement, one of the three original masses only is discoverable in the breast, and this has decreased apparently about fifty per cent.

Case XXIX—An induration in the chain of lymphatics along the lower border of the pectoralis major muscle, flattened in shape, and about the size of half a dol-

lar. Also two small indurated glands in the infra-clavicular region. Breast and axillary glands were removed two years ago for cancer. First came under treatment August 2, and has had ten treatments. The enlarged glands under the clavicle have entirely disappeared. The indurated mass at the lower border of the pectoralis major has resolved itself into two masses each about the size of a pea, and the patient appears to be getting well.

Case XXX.—Cancer of the right breast involving axillary glands. Patient first came under treatment January 20, 1902. At this time she was suffering constant pain, and the growth had been increasing rapidly for two months back. She received fourteen applications, and discontinued without explanation. At that time the tumors in both breast and axilla had decreased slightly in size and the pain had nearly disappeared. I met her six weeks later and she told me that she was getting better, and was not going to have anything more done. I am not aware of the subsequent history of the case.

Case XXXI.—Primary scirrhous cancer of the left breast, with indurated axillary enlargement. As the tumor was large, about the size of a small orange, and freely movable, I advised operation, to be immediately followed by the application of the rays. To this the patient consented, and the breast was extirpated, together with the axillary glands, on August 13. The rays were first applied on August 16, and the patient is still under treatment. I shall watch her future history with interest.

I will say here that microscopical section of the tumor after removal demonstrated that it was a fibro-sarcoma. A point of some interest in connection herewith is that, in spite of the large size of the tumor and the fact that it had been growing about three years, it was not adherent to the ribs and there was not the slightest retraction of the nipple. Another fact worthy of note is that the patient is but thirty-one years old.

Case XXXII.—Cancer of left breast, recurrent after extirpation for the same trouble three years previously, in cicatrix. The patient was treated twice without any apparent effect, and discontinued without explanation.

Case XXXIII.—Round-celled sarcoma of the neck of about three years' standing. Tumor involved an area of ten by seven inches, with an ulcerating surface of 5 by 3½ inches, which was eroded to the depth of an inch in one spot and not less than half an inch anywhere. There was considerable involvement of the adjacent lymphatic glands. Patient was suffering excruciating pain constantly. He first came under treatment November 20, 1901. During the next seven weeks he received seventeen treatments. The first treatment relieved the pain very appreciably, and after the sixth it disappeared permanently. Evidences of reparative action began to appear after the fourth treatment, and at the expiration of the seventh week the sore was entirely healed, the patient was entirely comfortable, and had returned to his work. At the present time a contraction of the scar has induced a partial paralysis of the recurrent laryngeal nerve, and has also involved the facial to a considerable extent, but no evidences whatever of recurrence are or have been present at any time since the sore became healed. I am happy to be able to make this last statement in public, because a report had been circulated upon several occasions that the disease had recurred in this case and that the patient was worse than ever.

The results upon the malignant process in this case are particularly noteworthy because of the extreme rarity with which sarcomas of the neck are overcome by any method of treatment. Dr. William B. Coley of New York, whose large experience with malignant growths clothes his statements with authority, says that he has

never seen a case of sarcoma of the neck cured by operation, and has not been able to find an authentic case reported by other surgeons. He says further in this connection, "If in the x-ray we have a means of destroying these growths, or a certain proportion of them, it means a great advance over present methods."

The clinical data of these cases may be summarized as follows:

Complete disappearance of the malignant process has apparently been secured in 3 cases; permanent reduction of tumor in 13; temporary reduction with subsequent increase in 1; permanent arrest only of growth in 2. There was no effect positively demonstrated upon the size of the lesions in 14.

Complete permanent relief of pain was secured in 14 cases; complete temporary relief in 2; partial relief in 8; no relief whatever in 4; and in 5 there had been no pain.

The general condition of the patient was permanently improved in 11; temporarily improved in 8; not influenced at all apparently in 8; and in 6 the general condition was not noticeably impaired when the patient came under treatment.

A gain in weight was evident in 6; no influence apparent in 27.

Hemorrhage was lessened in 8; uninfluenced in 1; and in 24 there had been no hemorrhage.

Evidences of systemic toxæmia were noted in 14.

In 5 cases there were discernible no evidences of benefit whatever. As 3 of these patients discontinued treatment after two or three séances, however, this statement can properly be applied to but 2 of them.

Out of 33 cases, then, we have up to the present time, 3 apparent cures; 13 that have been permanently benefited and are still improving with good prospects of ultimate cure: 12 that were temporarily benefited: 2 that experienced no benefit whatever; and in 3 the treatment was discontinued by the patient before enough applications had been made to indicate whether or not any results would have been produced.

In estimating the absolute value of these results we must bear in mind that every individual one of these cases was inoperable, and offered a hopeless prognosis both as to arrest of the disease or the attainment of euthanasia, under any other method.

The conclusions justified by the foregoing are as follows:

First, the pain of deeply seated cancer is removable by x-light to an extent ranging from slight amelioration to entire disappearance, in a large proportion of cases, whereby the victim is enabled to spend what remnant of life is left him in comfort and free from the pernicious phenomena which result from the continuous use of morphine, the only other therapeutical agent capable of producing even an approach to euthanasia, in any appreciable number of cases.

Second, in many cases x-light is capable of exercising an influence upon deeply seated cancer of sufficient intensity to markedly retard the progress of the disease, whereby life may be prolonged even in cases where it cannot ultimately be preserved.

Third, in a proportion of cases, the figure representing which has yet to be ascertained, x-light possesses the power entirely to overcome deeply seated malignant processes, restoring the patient to apparently perfect health.

Fourth, a small number of deeply seated malignant growths exhibit absolutely no indications that they are susceptible of influence by x-light, and continue their ravages apparently unimpeded, ultimately compassing the destruction of the victim.

Fifth, phenomena consisting of chills, rise of temperature, etc., indicating infec-

tion and systemic toxæmia, not infrequently accompany the treatment of malignant disease by x-radiance. This condition is probably due to the development or liberation of a toxin, the formation of which is, also *probably,* dependent upon retrogressive metamorphosis occurring in masses of tissue which have become too deeply involved in the malignant change to be susceptible of regeneration. This auto-infection is capable of reaching a degree of profundity sufficient to overwhelm the nervous system and destroy the patient, hence it is wise to interrupt the treatment temporarily when systemic toxæmia first appears, and allow the organism time to rid itself of the noxious accumulation before a further influence is invoked. Measures favoring elimination will of course be helpful to a patient in this extremity.

These conclusions, considered in connection with the unformly gratifying results reported by nearly everyone as following the application of this agent to the external and superficial forms of this disease, would logically lead up to an attitude toward the use of the x-rays in cancer which may be expressed as follows:

First, x-light can be relied upon to effect a greater proportion of cures of external cancer than any other measure or combination of measures now known, with the possible exception of massive mercuric cataphoresis as conceived, developed and recommended by Massey.

Second, in all cases of cancer where it may be considered advisable to use the knife, the already demonstrated influence of x-light in antagonizing cancerous degeneration may be looked upon as indicating its application for a time immediately succeeding the operation in all cases, and in some cases for a time immediately preceding the operation as well.

Third, in all inoperable cases, the x-ray is imperatively indicated, because in a few instances it has apparently effected a cure of processes the most deeply located; in a considerable proportion of cases it has removed pain effectually and improved the victim's general condition markedly, thereby rendering the remnant of his life comfortable; and lastly, because it is the only measure that offers the victim anything whatever in the line of hope for ultimate recovery or prolongation of life.

The time is not yet ripe for positive statements in reference to the relative values of coil or static machine as tube excitants, the absolute relative efficiency of high or low tubes, and many other points involved in the technique. In general, however, it may be stated that for superficial growths any good x-radiance is usually efficient, but for deeply seated processes rays of high penetration are essential.

Previous to a year ago it was generally believed that only superficial cancers were amenable to the curative influence of x-light, that it was necessary to induce dermatitis in order to secure a curative result, and that coil currents and low-vacuum tubes constituted the most efficient apparatus. Since then most brilliant results have been attained without the induction of any dermatitis whatever, and by employing high-vacuum tubes excited by the static machine. The coil and low tube, therefore, no longer enjoy an exclusive prestige. The disappearance of some cancers is hastened by setting up a dermatitis, and in these cases the greater volume of rays obtainable from a coil is undeniably of advantage inasmuch as a burn will result from shorter exposures; but the advantage is more apparent than real as far as ultimate results are concerned, as the high-vacuum tubes excited by the static machine will burn quite as thoroly, if the time of exposure is lengthened and the distance

of the tube from the patient's skin is decreased. I make this statement with a conviction born of an emphatic personal experience. Personally I treat superficial cancers with static machine or coil indifferently, and have not been able as yet to convince myself that the ultimate results differed in the least.

A measure which is frequently extremely useful in connection with x-rays, when a broken-down superficial case is responding slowly or unsatifactorily to the latter alone, is the static brush discharge administered from the wooden ball held about half an inch from the surface of the sore. The effects are sometimes most happy as regards the rapidity of the reparative process inaugurated thereby.

In the treatment of internal cancers, however, the coil is at a distinct disadvantage, and the speaker has discarded it entirely in this class of cases in favor of the static machine. The reason for the coil's inferiority is found in the greater volume of rays produced by this apparatus, whereby the time required to provoke a dermatitis is much shortened as compared with the conditions obtaining when a static machine is used. As a rule an exposure of ten minutes to rays excited by a coil is equivalent to one of fifteen minutes to those excited by a static machine, as far as liability to dermatitis is concerned. At first sight it would appear that the greater volume of the rays from the coil-excited apparatus would make up for the required lessening of the length of the time exposure, but up to the present time experience indicates that this inference is not correct. The beneficial influence of the rays upon internal cancer appears to be pronounced in proportion as the exposure is prolonged, and not to bear so much relation to the volume of the light. Hence an apparatus like the static machine, which enables us to maintain the corrective impulses for a period of time one-third longer than when a coil is used, exhibits advantages which cannot fail to make themselves felt in the long run. There is reason to believe that it may even, in some cases, constitute the difference between success and failure in securing favorable clinical results.

A question frequently asked is: "What make of tubes is best for therapeutical work?" I have employed half a dozen different makes, and as a result of my experience am of the opinion that it is the quality of the radiance as regards the degree of penetration and volume producible from a tube in relation to a given case, rather than the name of the manufacturer, that should be taken into consideration. The quality of radiance applied should be determined by the conditions surrounding the individual case; as a rule great volume is desirable in external cases, but for deeply seated growths volume should be sacrificed to penetration. Every good tube-maker produces apparatus capable of meeting the requirement of these different conditions.

A point involving some difficulty is the rapidity with which the vacuum of high tubes will be worked up beyond a manageable limit by the long and frequent seances demanded in therapeutical applications. Chemical regulation of the vacuum is a partial success, and ordinarily will nearly double the life of the tube. The method of overcoming the difficulty that has given me the most satisfaction has been to have the tubes made without chemical and exhausted to medium vacuum. Then when the tube refuses to glow from use, I bake it, at a temperature of 350° F., for from one to ten hours, according to the idiosyncrasy of the individual tube. If the tube is baked too long the vacuum will get too low, but that can always be easily overcome by running the tube hard for a few minutes with open spark-gaps.

The static machine used in the treatment of these cases was an apparatus of

the pure Holtz type, with twelve revolving glass plates thirty-two inches in diameter; the so-called Morton-Wimshurst-Holtz influence machine. The results attained with this excellent apparatus have led me to hope that I may be able to do still better with still more powerful radiance, and I have just purchased a sixteen-plate machine of the same type, with which I shall treat my deeply seated cancers in the future.

The use of a shield during treatment to protect the sound tissues surrounding a malignant growth is usually advisable when treating external cancers. It may be composed of any substance capable of absorbing the rays, but tin or lead foil, gauge about 30, is most widely adopted at present. Rubber sheeting about one-quarter of an inch thick is recommended by Dr. Albert C. Geyser of New York, and besides affording ample absorption of the rays, exhibits the additional advantage of not attracting any of the exciting current from the terminals of the tube. Under some conditions when tin is used enough current will be diverted from the tube terminal to render impossible the proper lighting of a high-vacuum apparatus. The shield should be large enough to cover all parts of the body exposed to the rays and near enough to the anode to make the production of dermatitis not at all probable, and a hole should be cut in it of a size and shape that will expose the growth and about an inch of the apparently sound tissue contiguous thereto. When treating internal cancer a shield is, of course, uncalled for and useless.

Unless he is unusually susceptible, the x-ray therapist will not require protection for himself, as the locating of the tube, placing of the shield, and all other procedures requiring him to remain in the field of threatening influence are executed before the tube is lighted. In some cases, however, a protection is necessary, especially for the hands, and I have used ordinary gloves backed with rubber sheeting one-eighth of an inch in thickness, with entirely satisfactory results. As I have said previously, the rubber is efficient in absorbing x-light, and the glove is fairly flexible and easy to manage.

The distance of the anode from the patient's skin is important. In external cases it may be from three to ten inches, depending upon whether it is desired to provoke or avoid dermatitis. In internal cancers the problem is slightly more complicated. It has not yet been demonstrated that the induction of dermatitis is beneficial when the growth is deeply seated, and as a burn is always a source of marked discomfort and sometimes positive suffering to the patient, the accident should be avoided when possible. Other factors enter into this problem, as individual idiosyncrasy toward the action of the ray, and the fact that sometimes the development of a burn is most insidious, no sign of its having occurred becoming evident for ten or fifteen days, when all at once we are confronted by a most disturbing state of affairs. During this period several treatments will have been given, each of course, augmenting the mischief inaugurated by the first. Two unpleasant experiences of this sort have led me to avoid the uncertainties involved by always locating the anode ten inches from the patient's skin during the first two weeks of treatment. If an idiosyncrasy exists it will show itself ordinarily in two weeks. If no sign of dermatitis appears at the end of this time the tube may be placed nearer the patient if it should be considered desirable. The closer the anode is to the growth the greater the effect obtainable, but in my experience it has not been possible to locate it continuously, during the large number of successive treatments ordinarily required in these cases, at less than eight inches from the

skin, without provoking a disturbance in this tissue sufficiently profound to demand cessation of the séances.

From a study of something over twenty-five hundred x-ray treatments administered by myself, I have adopted, as a routine measure, an exposure of fifteen minutes to rays excited by a static machine, and ten minutes when the coil is used. A longer exposure than this has ordinarily produced an undesirable degree of dermatitis, and a shorter has not produced a proper degree of beneficial influence. The time period of the exposure, however, is, of course, dependent upon the quality of the rays, the distance of the anode from the patient's skin, and the frequency of the treatments.

With reference to the last mentioned, in those external cases in which it is desirable to provoke dermatitis, the applications may be made every day for five or six days, or until the result has been obtained. Ordinarily, however, applications every other day for two or three weeks and with decreasing frequency thereafter will be found entirely sufficient to produce a cure.

In internal cancer it is necessary to extend the treatments over a much longer period of time, and as it is usually desirable that they should be applied steadily and with as little forced interruption as possible, three or four séances weekly should ordinarily constitute the limit. The skin of some patients will stand an application every day for two or three weeks, and in those cases I have sometimes found it advantageous to treat them every day until evidences of dermatitis were observable, then send them home until it disappeared, when the procedure could be repeated. Before adopting this plan, however, one must have thoroly ascertained the personal equation of his patient as regards susceptibility to the agent, or deep and unmanageable burns will be likely to result. In brief, the frequency of the applications is governed by conditions surrounding the individual patient, by the distance between the anode and the patient's skin, and the time period of the exposure.

A fact of some interest and one that acquires considerable importance under some conditions, is that after a patient has been rayed half a dozen times, the progress of recovery is not usually abruptly interrupted, even if the applications are discontinued. The process of healthy resolution will ordinarily continue for several weeks thereafter. Illustrating this point, I had a patient afflicted with a cancer of the lip as large as a silver half-dollar, under treatment for nine weeks without much apparent improvement. An attack of la grippe necessitated discontinuance of the treatment for four weeks. At the end of that time, when he appeared for resumption of the applications, the ulcer had reduced to the size of a silver three-cent piece, nothing having been done to the sore in the meanwhile.

In treating cancer of the uterus, some operators use a speculum to distend the vagina, on the ground that it is thereby possible to bring the rays into direct contact with the growth and secure a greater curative influence. I have never adopted this plan, because a vagina susceptible of distention sufficient to bring the whole of the diseased tissue within the field of application is a rare phenomenon. The peripheral portion of the growth where the process is spreading is that which it is most important to bring under the influence of the rays, and that is the very portion which the speculum fails to expose. Before reaching these parts, the rays must pass through the perineal tissues the same with as without the speculum, hence, as far as securing material arrest of the malignant process is concerned, I fail to see in what way it offers any advantage, except when the growth is small enough to render adequate exposure possible. If the growth is small enough for this, it would probably be bet-

ter not to depend upon x-rays exclusively, but to remove it with the knife first and ray afterwards, or subject it to massive mercuric cataphoresis.

The speaker's method of applying x-rays to uterine cancer is as follows: A tube of greatest possible penetration is used, excited by a static machine. With the patient in the dorsal position, legs flexed upon the body, the rays are directed upon the uterus through the perineum at one séance. At the next séance the patient lies upon her back with legs extended, and the rays are directed upon the uterus through the anterior abdominal wall, with the anode located high enough so that the pubes will not intercept the light. By thus alternating the areas of skin through which the rays are passed during successive treatments, the applications can be made twice as frequently as when the light is made to traverse the same path each time, without calling up a troublesome dermatitis. The skin about these areas always becomes deeply tanned ultimately, and later the tanned epithelium peels off, leaving a bright, fresh skin beneath, which appears to grow less susceptible to the destructive tendency of the rays with each repetition of the process. A limited degree of tolerance appears to be created.

In my opinion it will be found ultimately that the x-ray and the knife can be advantageously combined in the management of many cases of deeply seated cancer. The cancer cell is one that has reverted to a more primitive type, hence its rapid proliferation and lowered vitality, upon which characteristics its malignancy depends. The action of the x-ray seems to be in the line of a corrective of this tendency to reversion rather than cauterant and destructive. Whether this action is secondary, and dependent upon a primary destruction of inhibitive influence exerted upon a parasite, whether it is due to a physiological influence upon primarily aberrant protoplasmic activity, or whether it is destructive action exercised selectively upon the diseased tissue, is a matter which is still subject to discussion, but the important point in this connection is that such an action is exerted and that it can be utilized. When, therefore, a large cancerous growth is encountered that would ordinarily be considered inoperable, removal of it, or as much as possible of it, will render possible a more concentrated application of the rays to its remote threatening peripheral areas. As the patient's condition is ordinarily hopeless anyway, the gravity of the situation is not augmented by the extirpation, whereas the chances of a successful outcome to the use of x-rays are increased.

In the cases usually looked upon as operable, but even in the most favorable of which as regards prognosis the percentage of recurrences is so large, it is probable that in the near future it will be looked upon as wise to invoke this corrective action of x-light by raying the tumor for two or three weeks before operation, and to endeavor to perpetuate the tendency toward normal tissue formation by immediately following the removal of the growth with another course of radiotherapy. By thus combining methods, the malignant process is gotten rid of en masse and at once, and the patient is given the best possible chance of remaining without the limits of that sixty or seventy per cent category, expressed by the term "Recurrent after operation."

In conclusion, I wish to state my emphatic conviction that the therapeutic application of the ray should be intrusted only to the hands of operators who are skilled and experienced in this particular line of work, where it is possible to secure such, as the difference between efficient and faulty technique will frequently constitute the difference between success and failure in clinical results, as well as between safety and danger to the patient.

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PROFESSOR ARTHUR W. GOODSPEED
President American Roentgen Ray Society for 1903.

THE AMERICAN
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VOL. XI. ST. LOUIS AND CHICAGO, DECEMBER, 1902. No. 6.

Equi-Potential Surfaces in the X-Ray Field—Their Production and Utilization.*

BY JOHN T. PITKIN, M. D.

Soon after the discovery of the x-ray by Professor Roentgen in 1895, the speaker caused to be installed in his office a Holtz static machine having eight revolving plates. During the seven years that have intervened the number of revolving plates has been gradually increased, till today it is forty-six.

Focusing or Jackson-Crookes tubes, which were then about the size of a large thumb, are now the size of a small arc light globe. Spark gaps, at first but one or two, can now be increased to forty or fifty in number. Improvements in all the details of construction of the x-ray apparatus have been commensurate. It is thus from a practical experience with generators of varying size and construction that I am able to draw the following conclusions:

For a one wheel static machine to produce a quantity of x-radiance equal to another machine having forty-six revolvers, it must be operated forty-six times as fast and sustain no additional loss of current thru the atmosphere or upon the neutralizing system in consequence of incidentally increased voltage or tension.

The electrical loss in air can be estimated by the degree to which a glow lamp, held in the hand of the operator with its base toward the apparatus, is lighted, by the charging of a Leyden jar held in the same manner, or the precipitation of elementary carbon upon the exterior of the Crookes tube and other objects of the apartment with which it is immediately surrounded. The loss upon the neutralizing system can be seen by inspection of its collecting combs after the room has been darkened.

The greater the number of plates in the generator the (1) larger is the volume and the steadier and more penetrating the x-ray field, (2) the lower the tension or voltage, (3) the less the loss of current, (4) the larger and softer the tube which can be operated, (5) the more concentrated the cathode rays and (6) the longer lived the tubes. Conversely as the vacuum in a tube rises beyond a given point, the capacity of the tube decreases, a smaller machine can fully excite it, the rays are penetrating but attenuated, the kathode rays become more eccentric and the electrical loss is greatly augumented.

I prefer the static generators to the sparking coils, because their discharge is continuous, direct and uniform; with them we work upon a primary, not a secondary, tertiary, or quaternery circuit. They are less affected with induction complications, do not break down from internal discharge, have no make and break to fail to operate, and cause less strain upon the tubes, thru which their discharge is more concentric. They afford us an ever ready, never failing source of electrical supply.

It is one of the requirements for the generation of static electricity that a dielectric shall be interposed somewhere in

*Read before the American Roentgen Ray Society at Chicago, Dec. 10, 1902.

the circuit in order to create and maintain a difference of potential. The dielectric so employed is usually the air space between the discharging rods or the rarified air in the interior of the Crookes tube. If, within certain limits, the air spaces are increased in length or number, or the gas within the tube becomes more rare, while the generator maintains the same speed, then the volume and potential of the current will rise proportionately, causing the x-ray field to increase in volume and penetration. I am indebted to the writings of Nichola Tesla for my first knowledge that many small air gaps in simple series are superior to one long interval. He places several metallic buttons in a row between which the current is operated.

My improvement consists in a glass rod one foot long about the size of your little finger. This rod is made to project like a semaphore, horizontally outward and obliquely forward from the arm of the positive prime conductor, between the great ball and the handle of the discharging rod. Onto the glass rod are slipped several plain band brass rings which are made so that they can be moved freely inward to close or outward from each other to form intervening air gaps. When the brass rings are separated from each other and the current turned on, a beautiful cascade of sparks plays between them, nearly surrounding the glass tube on all of its exposed sections, and the generation of x-rays is greatly intensified.

With this spark gap multiplex very low vacuum tubes can be operated and wonderful therapeutic effects obtained. But as the vacuum in the tube rises the number of intervening spaces should be decreased proportionately, and the resistance of the tube employed in its reciprocal relation. A series of spark gaps, to be most effectual, must provide a disruptive, not a connective, discharge between the various sections. The brass rings can be moved to and fro upon the glass rod with an insulated pointer held in the hand of the operator, or one of the electrodes supplied by all the makers of static machines can be employed for that purpose.

If hard rubber is used as a support for the brass rings instead of glass, as described above, it will be oxidized by the current and the discharge beeome connective and irregular.

A properly excited Crookes tube should present a green or active and a dark or inactive hemisphere. Any deviation from this ideal condition represents wasted energy. If the operator faces the active hemisphere and looks thru a fluoroscope in front of which he holds vertically a sheet of glass in such a manner that he can only discern the shadow from its proximal edge, then the sheet of glass will indicate the direction taken by the rays which it obstructs between the Crookes tube and the observer's eye. If at equal distance from the tube he moves to the right and left, observing the same precautions, he will describe a semicircle with its convexity outwards, the same results will be obtained if holding the glass plate horizontally he moves upwards and downwards.

After several similar reckonings have been made at varying distances from the tube in the x-ray field of energy he will be able to determine the latitude and longitude of the rays, demonstrate their rectilinear and diverging course from the glass walls of the tube outwards into space, and map out with mathematical precision innumerable equi-potential surfaces.

In order to prevent distortion of the image and obtain correct localization of foreign bodies the fluoroscopic screen and photographic material should be made to conform to the shape of these equi-potential surfaces.

As the anatomical structures to be examined have by construction the desired shape *i. e.,* convex from side to side and convex from above downwards, why should

not the x-ray pictures of the inside of the human body be as free from distortion as the delineations of its exterior by the expert photographer?

Buffalo, N. Y.

Chicago, December 10, 1902.

At the annual convention of the American Roentgen-Ray Society now being held in Chicago, the following resolution was passed, after which W. E. Goldsborough, Chief of the Department of Electricity of the St. Louis Exposition, addressed the convention upon the invitation of the Chairman of the Executive Committee:

WHEREAS, The American Roentgen Ray Society, in convention assembled, has heard with satisfaction of the plans and purposes of the Department of Electricity of the World's Fair of St. Louis, 1904, to bring together a thoroly representative and advanced exhibit of Roentgen ray and electro-therapeutic apparatus,

Resolved, The American Roentgen Ray Society, being deeply interested in the success of the Roentgen ray and electro-therapeutic exhibits, extend to the Department of Electricity of the Exposition assurances of its cordial support, believing the plan and scope of the exhibits will meet the expectations and approval of the medical profession.

Following the excellent papers in our last issue by Dr. Clarence E. Skinner and Dr. W. B. Snow, we publish a report of some cases of cancer treated by x-rays by Dr. J. D. Gibson. Dr. Gibson's work shows some of the possibilities before us in even extreme cases, when thoro knowledge and practical skill are combined to devise the best forms of treatment. In fact, what is now most needed in x-ray therapy is a full report of the technique of the treatments that have failed to cure. A careful study of these would probably disclose some of the reasons for the failures.

How to Treat Cancer.

BY H. VALENTINE KNAGGS, M. R. C. S., L. R. C. P., LONDON, ENG.

WHAT CANCER IS.

In nature the animal and vegetable kingdoms stand in direct antagonism to each other, and what the one builds up the other destroys.

The vegetable gives off oxygen and absorbs carbonic acid, water, and ammonia from the air and soil to produce various food products. The animal, feeding on these food products, reverses the process. It absorbs oxygen, burns up the food, and returns the carbonic acid, etc., to the earth and air.

When either animals or vegetables are deprived of sunlight, pure air, and pure food, and have mainly to rely for their nutriment on a tainted atmosphere and septic foods, they each tend to revert to the opposite kingdom.

The vegetable becomes less highly organized and simulates in time the fungus, while the animal becomes tuberculous or cancerous. The fungus absorbs oxygen and emits carbonic acid, and is really a vegetable usurping animal functions. In the same manner animals become cancerous when their structures usurp the functions of the vegetable.

HOW CANCER IS PRODUCED.

Cancer is a fungoid growth, becoming a pseudoparasite, growing upon and at the expense of the animal tissues upon which it flourishes.

Cancer is produced in a system which contains an excess of unoxidizable lowly-organized nitrogenous matter, just as the vegetable fungus grows in the same kind of soil.

The unoxidizable material may be introduced thru the assimilation of tainted, salted, and fermented foods, by toxin elements in the blood affecting and fermenting retained nitrogenous waste, by the constant inhalation of stagnant atmospheres filled with molds and yeasts, or by

the absorption of the poisonous products of retained excreta, as in constipation.

The conversion of the unstable nitrogen into cancer is promoted by the natural retrograde action which takes place in certain organs and tissues as a result of age, and also as a consequence of a syphilitic, tuberculous, or other cachexia. It is further encouraged by an excess of carbonic acid in the system and a diminished absorption of oxygen, resulting from neglect of exercise, inadequate respiration, prolonged staying-in-doors, and the use of alcoholic and carbonated mineral waters. Cancer growth is also promoted by the free use of common salt. This is analogous to the fact that gardeners water mushroom beds with warm salt solutions in order to produce a copious crop.

ELECTRICAL TREATMENT.

To treat cancer successfully it is necessary to first destroy the life of the tumor and cause absorption of the growth itself by the use of suitable light-heat baths, x-ray exposures, and high frequency currents. All of these forces, in practice, have their various uses in individual cases, but the "High Frequency" apparatus, on account of its simplicity and absence of dangerous after effects, is probably the most advantageous for routine work.

Indeed, as the "High Frequency" treatment becomes more generally known and its merit recognized, it is likely to largely replace x-ray exposures and other methods of administering powerful electrical currents.

"High Frequency" acts best when used in immediate conjunction with the light-heat bath. The flow of the current is facilitated by the moist well-acting skin. The light of the bath also aids the treatment.

The efficacy of electricity is due to the action of a very powerful electrolysis. The ozone, liberated in the tissues subjected to its influence, destroys the lowly organized life of the malignant growth.

The gradual softening down and disintegration of the tumor under *repeated* applications of these electric forces is followed by a rise of temperature, an increased production of tissue waste, marked activity of the various excretory organs, and the formation of purulent debris. General treatment to supplement the purely electrical measures must therefore be vigorously pressed to ensure permanent results.

ADMINISTRATION OF SULFID OF CALCIUM.

The septic condition of the blood and the tissues, upon which the cancerous cachexia depends, can usually be remedied by the persistent use of sulfids and especially of the sulfid of calcium.

The drug is easily given in the form of 2½-grain compressed, sugar-coated tablets. The daily dose should be from twenty to forty grains. These large doses are, with some few exceptions, readily tolerated by the system and can be continued, with occasional short intermissions, for an indefinite period of time. The cancerous condition establishes a tolerance of the drug and patients will improve materially, both in their health and appear-servers have used sulfur in various forms for the treatment of cancer, and in some hands it has met with a considerable measure of success.

In 1880 Professor Clay, of Birmingham, startled the world by his discovery of what was supposed to be a cure for cancer. His remedy consisted of a mixture and pill containing sulfur and Chian Turpentine. The mixture, in addition to the Chian Turpentine, contained 2½ grains of sulfur to each dose and was to be taken three times a day. The pills contained 3 grains of the Turpentine and 2 grains of sublimed sulfur, of which two were to be taken every four hours. If these formulæ are worked it will be seen that the patient was taking quite 30 grains of sulfur daily, which is an appreciable daily dose.

In 1882 Dr. Barton pointed out the value of sulfid of calcium in cancer after operation, given in doses of ½ to 3 grains. He reported three cases treated after operation, and the principal point which he noticed was the rapid way in which the patients gained strength and flesh. Dr. Barton further reported two well anthenticated inoperable cases of cancer in which this remedy caused the disease to disappear. He gave it in doses of 1/3 of a grain, increasing to 3 grains three times a day.

The writer has a number of cancer cases where the tumor has been removed which are taking this remedy with excellent results in doses of ½ to 3 grains three times a day. In only one case has there been recurrence, after eight years of good health, and then the uterus became affected after an excision for mammary cancer. The recurrence was attributable to the prolonged strain of nursing a sick husband suffering from phlebitis, in which the wife had very little rest by night and seldom left the house for fresh air for weeks together. Two of the worst cases still under observation, which were of a very virulent type in patients under 40 years of age and operated on many years ago, are at the present time in perfect health.

In cases where no operation has been performed it will greatly aid the electrical treatment if large doses of the sulfid of calcium are simultaneously given. Even if the electrical treatment is not available. the writer has seen very good results from the use of this drug in large doses.

FREE SKIN ACTION.

To promote rapid elimination of tissue waste and poisonous toxins generated by the growth (thereby assisting the work of the electrical and sulfid treatment), the light-heat bath or the ordinary Turkish bath should be resorted to.

The ideal bath for this purpose is that in which the heat is generated by electric incandescent lamps, of which there are several forms in use. In addition to a combustion-free heat there is added the curative element of light. As this kind of bath is unfortunately beyond the means of many patients, the ordinary portable Turkish bath, now sold at a very low price, will answer the same purpose, and can be used at the patient's own home at a time when it is most convenient to use it. The portable vapor baths have the great advantage that the user is not breathing a vitiated air, as would be the case in the public baths.

As a preventive measure after operation for cancer, one or two baths weekly will suffice to retarl or prevent recurrence. In inoperable, or early operable types, or in cases in which recurrence has taken place, it will generally be found advisable to order the baths to be taken daily or on alternate days, either when the patient retires to bed or on rising in the morning.

HYGIENIC TREATMENT.

Hygienic treatment for cancer should be directed towards increasing respiratory efforts, and in securing an unlimited supply of pure vital air. It would be best to have the dwelling-house built on high ground, sheltered from cold winds, and at a distance from marshes, rivers, and woods. The house must be sanitary, its drainage perfect, and preferably of modern construction. Cancer often seems to haunt old houses in which the woodwork and other parts are decaying, or are on the verge of decay. As much moving vital air as possible should be introduced into the house itself and all windows should be widely opened, winter and summer, night and day, to let the rooms be thoroly ventilated. The air of rooms gets stale and tainted with moulds and yeasts if not frequently changed and kept moving.

Regular exercise should be taken, short of fatigue, in the fresh air. If patients are unable to walk they must sit or lie in the open during a considerable part of the day. Deep breathing should be regularly

practiced by all sufferers and various mechanical exercises which increase the breathing capacity of the lungs systematically persevered with.

DIETETIC MEASURES.

The general dietetic treatment resolves itself into one of training back the patient to a more highly organized state by means of a healthy and natural method of living. The action of the kidneys should be encouraged in order to remove accumulating tissue waste and injurious toxin products, as well as to regularly flush the entire system. This can be effected by drinking freely of hot distilled water, oxygen water, lemonade made with fresh lemons, coffee, and other similar beverages, and should be combined with the plentiful use of potassium salts; which are best obtained from sound, ripe, succulent fruits and fruit juices. Constipation must be corrected by the use of fresh or dried fruits, stewed or otherwise, and coarse wheaten breads, or grains made into porridges, etc. This should be supplemented in obstinate cases by suitable vegetable aperients such as syrup of figs or extract of Cascara Sagrada, or even by ordinary or electric-vibration massage to the abdomen.

Fruits, nuts, and well dextrinized grains, properly cooked vegetables, biscuits, whole-meal bread made without yeast, or well toasted or baked yeast-made bread, should constitute the staple articles of daily diet. These should be combined with new laid eggs, milk, cream, and fresh butter. Vegetables should be cooked in their own juices with a minimum of distilled water and without salt or soda, so that the valuable potassium salts contained in them should not be lost. Vegetables are best prepared for the table in a steam cooker. Flesh foods should be eaten very sparingly, if at all, and all beef-teas and meat extracts discontinued. In order to cut off the supply of unoxidizable nitrogen or of anything likely to feed a cancerous condition, all cured, fermented, salted, and tainted foods, as ham, bacon, dried or tinned fish, sausages, game, cheese, pickles, vinegar, etc., should be excluded from the dietary.

Alcoholic or carbonated waters are also to be avoided; sugar and salt should be eaten very sparingly.

CONCLUSION.

The best way to ensure the absolute efficiency of these measures would be to treat the patient in an Open-Air Sanatorium, when the entire treatment here suggested could be closely and carefully watched daily.

It is highly probable that in a few years' time Cancer Sanatoria will be universally established thruout the country on lines somewhat similar to those at present working for Tuberculosis. The chief alteration would be in the matter of the diet.

The writer has attempted to carry out the treatment on a small scale in general practice, and the results so far have been very encouraging.

Program of the Chicago Meeting of the American Roentgen Ray Society.

WEDNESDAY, DECEMBER 10.

MORNING SESSION, 9:30 O'CLOCK.

GENERAL BUSINESS.

READING OF ESSAYS.

1 X-Ray Physics,
T. PROCTOR HALL, M. D...CHICAGO, ILL.

2 Equal Potential Surfaces in X-Ray Field.
JNO. C. PITKIN, M. D...BUFFALO, N. Y.

3 Instantaneous Skiagraphy,
MIHRAN R. KASSABIAN, M. D., ...
.....PHILADELPHIA, PA.

WEDNESDAY, DECEMBER 10.

AFTERNOON SESSION, 2:30 O'CLOCK.

PRESIDENT'S ANNUAL ADDRESS.

4 (*a*) Systematic Records,
(*b*) The Routine Use of the X-Rays,
M. J. WILBERT.....PHILADELPHIA.

5 Skiagraphy as an Art,
J. RUDIS-JICINSKY, M. D.....
.....CEDAR RAPIDS, IA.

6 Results and Technique in Treating Epithelioma with X-Rays,
EMIL H. GRUBBE.....CHICAGO.

WEDNESDAY, DECEMBER 10.
EVENING SESSION, 8 O'CLOCK.

7 The Roentgen Ray as a Therapeutic Force, from a Clinical Standpoint, with Illustrative Cases.
JOHN B. MURPHY, M. D..CHICAGO, ILL.

8 Treatment of Three Cases of Cancer, One Case of Tuberculosis and Seven Cases of Rodent Ulcer and Lupus,
G. P. GIRDWOOD, M. D.MONTREAL, CAN.

9 The Technique of Treatment of Malignant Growths,
J. N. SCOTT, M. D...KANSAS CITY, MO.

THURSDAY, DECEMBER 11.
MORNING SESSION, 9:30 O'CLOCK.

GENERAL BUSINESS.

10 Radio-Therapy in Pulmonary Tuberculosis,
GORDON G. BURDICK, M. D., CHICAGO ILL.

11 X-Ray Treatment in Intra-Abdominal and Other Deeply Located Malignant Growths,
CLARENCE E. SKINNER, M. D.....
....NEW HAVEN, CONN.

12 Diagnosis of Calculi by X-Rays,
RUSSELL H. BOGGS, M. D.....
.....PITTSBURGH, PA.

THURSDAY, DECEMBER 11.
AFTERNOON SESSION, 2:30 O'CLOCK.

13 The Technique of X-Ray Therapy,
H. PRESTON PRATT, M. D., CHICAGO, ILL.

14 Result of Treatment of Guinea Pigs Affected with Tuberculosis by High Frequency Currents,
G. P. GIRDWOOD, M. D., AND C. HIGGINS, D. V. S.

Spark Gaps in Series.

Dr. Barnum of Los Angeles is credited in the daily press with the discovery that a multiple spark gap increases the efficiency of an x-ray tube.

All experienced x-ray workers regulate the spark gap or gaps in order to get the best results. The arrangement required varies with the nature of the current and the style and condition of the tube.

The x-ray photograph is a convenient scape goat in unpracticed hands. The serious error in x-ray diagnosis by which the stomach of Frank Buettner of Cleveland was opened to find some false teeth which were afterward found under his bed, is another indication that only medical experts can be relied upon for such work.

Practical X-Ray Diagnosis.

Prepared by J. Rudis-Jicinsky, A. M., M. D., M. E., Cedar Rapids, Ia. Revised by M. U. Dr. Joseph Hoffman, Vienna, Austria.

A series of A B C teaching for workers in x-ray diagnosis and therapeutics, to be concluded in 20 lessons. Fully illustrated.

Lesson 18.
Fractures and Dislocations

The x-rays have become an accepted diagnostic agent in all fractures and dislocations, and on the other hand they may be used with their pictures as a basis of suits for damages for malpractice, which factor has deterred many surgeons from using this means of verifying a diagnosis as often as they should. This peculiar antipathy is being overcome, however, by the knowledge that an x-ray picture of fractures or dislocations must be made by an expert, and has to show the different layers of the muscles and the marrow cavity or internal structure of the bones in order to be considered good evidence, along with all the other clinical facts and factors in each individual case. So that, while a skiagraph is of undoubted utility as an aid to the correct diagnosis and treatment of a fracture, it is not of itself satisfactory proof in all cases of the existence of such injury, nor does it necessarily indicate the nature of an injury or the probable results. In medico-legal cases therefore it is much more wise and safe to ask for the negative as well as the positive print. A work on surgery which did not give full credit to the diagnostic advantages of the rays, especially in fractures and dislocations, would not be up to date. It is not necessary to more than mention their diagnostic value in honest and capable surgical hands. They are not only valuable in corroborating the status presens discovered by the usual methods of diagnosis, but at times by their aid we can discover lesions not recognizable by ordinary methods of examination, and the systematic use of the rays has confirmed the suspicion that fractures not infre-

quently exist with but slight symptoms, especially in children. It is now, in view of the advancement in this diagnostic measure, within the power of every physician, especially in the country, to be his own consultant and frequently correct his own mistakes, which would not and could not otherwise be recognized until too late. This being possible, it gives us also a correct record of our procedure during the whole of the treatment, if we wish it, and may protect us in every case.

There has been much written about the distortion, as a defect of this new method of diagnosis, but how about the microscope, ophthalmoscope, or any other delicate instrument? You have to look until you see something; and in fact, to the unpracticed eye, the microscope or ophthalmoscope is much more liable to lead one astray than the very simple application of the x-ray. To practice medicine, we had to study; to manage an individual case of typhoid, we have to read; to operate in a difficult case, we have to look up our authorities; and to manage the new means of diagnosis, the x-ray, we have to study just as well.

It is very simple, indeed, to get hold of the handle or switch and produce the rays with the help of the coil or the static machine, but it is really very difficult to manage the same and to know what to do in some cases, when the fundamental laws and principles of the technique are not understood. And let us state right here, that such nonchalance was the main cause of misrepresentations and many mistakes in the beginning of the x-ray phenomena, attributed falsely to the x-ray instead of to the operator himself.

The bone relationships in joints, the various joint movements, dislocations in what direction, fissures, true and "green-stick" fractures, depressions, separation of a splinter or apophysis; the direction and character of the line of the complete fracture, whether transverse, oblique, longitudinal, V or T shaped, or comminuted; the seat of the fracture, as to the neck, head, shaft, separation of the epiphysis, or if extended into a joint; multiple, compound or gunshot fractures; fractures of nasal septa, in the cavities of the head, near the sutures or grooves; can all be studied in a striking way with the help of the x-ray, and the different steps in bone development or repair observed. In regard to the callus formation, perfect or cartilaginous, union or non-union, caries, deposition of earthy salts in the joints or along the bones, the opening of the nutrient artery, centres of ossification, deformity, and functional ability, the x-ray tells us the truth and will teach us to do more honest and successful surgery. When the proper conditions and positions are known, the ray cannot mislead, its revelations are correct and infallible.

If fracture exists, whether it is simple, compound, or complicated with fissuration or depression, it is determined with the fluoroscope in five to ten seconds, or a skiagraph may be taken, without any aggravation of pain or any danger of complication to the patient. The skiagraph may be taken thru the first dressing, if necessary. In impacted fractures the diagnosis is impossible in any other way without great damage. The ray may also point out when reduction and coaptation can be effected, or when operation is necessary.

But the main thing! With the help of the x-ray we can make a correct diagnosis through the preliminary dressing, take the same off when the diagnosis is made and reduce the dislocation, apply proper dressing and observe with the fluoroscope in hand and under the ray during the whole procedure, our work until complete. In a case of fracture, we put the fragments together and apply the splints more accurately to each individual case, and thru them carefully observe the result of our work. We may change the positions of the fragments, if necessary,

and in time, and apply our final dressing when the fragments are fixed. The dressing need not be changed until absolutely necessary, and we may further observe thru the dressing the growths of the callus, whether the union of the bones is taking place or not, or photograph thru a plaster of Paris case, after an attempt at reduction, and see if proper approximation of the fragments has been accomplished, and find sometimes, perhaps, that the union did not and could not take place. This, under no circumstances, could be made out by other means of diagnosis. Or, if we have a case of suspected fracture or dislocation or both, where the swelling will not allow any digital examination on account of the pain or the inflammation which masks the true condition, the simple application of the ray at once reveals the status, without any discomfort to the patient and with great satisfaction to the surgeon. The greatest diagnostic difficulties are offered by the joints and by old fractures. The older it is, the less conspicuous the line of the fracture will appear, being overshadowed by the callus, according to the type of fracture. Sometimes we may have a refracture, especially important in medico-legal cases, and there we have to compare and study carefully the shadows of the first and the secondary callus.

In railroad cases we may see every particle of the crushed bone through the preliminary dressing and determine whether amputation is necessary, and how much can be saved. Skiagraphs in such cases, taken as soon as possible after the accident, again after first dressing and again when the patient is discharged from the care of the surgeon, leave the record complete. A skiagraph of the stump may sometimes be very interesting and useful. Such a method of correct diagnosis, and the whole procedure in each individual case, would be the only just solution of a contention between employer and employed. All this is done without general anesthesia. How often is the operation really of secondary importance as compared with the dangers of anesthesia in similar cases? With the facts before each party to the case, clear and unmistakable to both, is it not reasonable to think that litigation would diminish and enmity vanish?

In military surgery the x-ray enables us to work without the dreadful probe to observe the effects of the bullets on the different bones of the body, and will positively diagnosticate the existence or absence of a fracture, and when in close proximity to joints, it will show us not only the cause—the bullet—but whether or not the fracture extends into the joint, whether the fragments are displaced, or what other destruction of the bones has taken place. In such cases skiagraphy is evidently little more than an adjunct to other methods of examination, but if we choose we may try our sense of touch and determine the condition of affairs in the old way, or be protected and be sure by means of the new way. For any unavoidable repetition which may occur in the following descriptions I beg the reader's consideration.

In respect to photographic work, it is sufficient to say that the technique in fractures and dislocations is about the same as in other lesions. Care is to be taken again and again that the object sought be as near as possible to the plate. The sensitive plate after exposure is called a "negative," because all the dense portions of the subject are shown as being transparent on the glass, and the transparent portions of the subject are shown as being dense on the plate. These relations are rectified, however, in the print, which in place of being a negative has become a positive view. There is one thing to be remembered in skiagraphy—especially in medico-legal cases, which have to be explained to the jury or the court—

and that is that if the right hand is exposed to the ray, it will appear as a right hand on the negative, but when printed will have its position reversed, so that it looks life a left hand. (Morton.) This is certainly a very important point, and has to be constantly in mind in skiagraphing fractures, injuries to the bones, dislocations, etc., and especially in railroad cases.

If we have to examine the hand, the fluoroscope examination may be sufficient for correct diagnosis, especially if we compare the injured hand with the normal one, and finally examine the different bones in an articulated skeleton. If a skiagraph is needed, it is better to remove the dressings, if possible. If not possible, expose a little longer, examining the injured hand by moving in all directions before the plate is brought in. The same is true of the wrist and forearm, which are skiagraphed better if the hand or arm are in position of pronation directly over the plate. If the patient sweats easy, protect the envelopes with one layer of paper, or blotting paper, or as suggested in previous lessons. If the patient rests with the elbow on the table, splints are removed and the skiagraph is made in a few seconds. If the splints can not be removed, or if there is great swelling, the exposure has to last a little longer without intensifying screens. With a screen we have to be on guard not to overilluminate, and have the parts in proper position. If necessary, we have to use a fluorometer. Skiagraph both wrists, and take the lateral view, in pronation and supination, to get any deviation from the normal for a proper medico-legal record. In young patients, the epiphyses and their divisions must be observed carefully, remembering that a line of fracture is not smooth, as in the separation of epiphyses. Fractures of the radius and ulna are diagnosed very easily, but Colles' fracture, fracture of a sesamoid bone, fractures of phalanges, especially fissure fractures, and incomplete fractures generally, are the most frequent, and are altogether different from what books on surgery used to tell us. The treatment differs also, according to each indiviual case, splints being adapted exactly to the lesion found. In examining the elbow, move the joint, and observe laterally first. If the humerus is involved extend the arm. In making the picture put the elbow on the plate in lateral position or antero-posterior position, according to the results of the fluoroscopic examination which was made first and gave us a clew how to bring the lesion as near as possible to the plate. Fractures of the olecranon are made out very easily. The intra-articular space is more transparent, and the diagnosis of ankylosis, whether bony or false, is made possible. In children we should not be confused by the epiphyses or the head of the ulna, which on account of its peculiar shape and anatomical construction may seem to be fractured. Skiagraphs of any dislocations at the elbow are made readily, and are reliable records of status presens. Fractures of the humerus or dislocations of the shoulder joint have to be observed fluoroscopically first, posteriorly and anteriorly. It is always better to skiagraph in such a case, putting the patient on his back, and the plate under the shoulder. In all such cases, if necessary, the parts skiagraphed have to be immobilized, as suggested before, and the hand examined put in pronation over the abdomen. Fractures of the clavicle and of the ribs are seen with the fluoroscope very nicely, but fractures or injuries to the scapula and cervical vertebræ are better skiagraphed from two positions at least, laterally and antero-posteriorly. Injuries to maxillary bones and bones of the skull are better studied in a skiagraph made with the help of the intensifying screen. Results are not always good, and we may have to make several exposures to get a good picture. Fractures of nasal bones are recognized

easily with the fluoroscope. Examinations of the lower extremities are practically the same as those of the upper extremities. If we get a good negative, it is well sometimes to enlarge the same, and reproduce all the details found in a marked contrast with a simple shadow picture. to make a good skiagraph of the foot it is absolutely necessary to make our fluoroscopic examinations first and compare the injured part with the normal one. We ask the patient to step on our plate carefully if metatarsus and phalanges are photographed; if tarsal bones are injured or diseased the plate is put against the dorsal part of the foot, which must be elevated, and a second picture is taken with the plate under the foot. In examining the ankle rotate the foot and observe carefully, find the injury, and place your patient on his back in making a skiagraph. Immobilize the foot properly. The tibia and fibula, when skiagraphed, must not overlap each other, and be distinct, the marrow cavity showing plainly. In injuries of the knee joint or of the femur make always two pictures, placing the plate either on the inner or the outer side for the second. The hip-joint is hard to take for beginners, and the pelvis is also. In such cases we take always two plates for verification, intensify the negative, or proceed according to the directions given in previous lessons with a lead-box or lead support under the plate, and the screens. Read the negative properly, observing the white lines of the ridges near the great trochanter, and dark lines which may indicate extra or intracapsular fractures or diseased portions of the bony structures. In these cases or in skiagraphy of the pelvis it is well to use large plates, and the patient should be told to evacuate the bladder and the rectum before exposure. For lumbar and dorsal injuries use separate plates or flexible films, if possible.

Report of Cases of Cancers Treated by X-Rays.*

By J. D. Gibson, M. D., Birmingham, Ala.

I bring before you for discussion today a report on some cases of the various forms of cancer that I have treated by means of the x-ray.

As it is comparatively a new field I think it requires a most thoro investigation of all of the development in order that we may the better help the sorely afflicted with this terrible disease.

Case I.—D. D. B., of Memphis, Tenn., white, age forty-six; occupation, insurance adjuster. A case of melano-sarcoma. He first sought medical advice in May, 1901, for ulcer on the left side of the mouth, supposed to be caused by an old tooth, and was informed of the suspicious character of the ulcer. He was operated upon on the first day of September 1901, by prominent surgeons of his city, and the growth removed. The wound healed kindly and all seemed well, until January, 1902, when the pains became very violent in the jaw and neck and the growth began to reappear.

In the following February another operation for its removal was made by the same gentlemen, and in ten days it was back and almost as large as ever. April 1 he went to Chicago where it was treated by paste applications for two weeks, and was then told to return home and poultice it for sixteen days, and then return to Chicago. He did so, and was promptly informed that he was beyond the reach of aid by this means, and he had better return home and make his preparations for death. All the hospitals of Chicago refused him any hope and so he returned home, only to meet the comforting assurance from his physicians that death

*Read at the annual meeting of the American Electro-Therapeutic Association. From the official organ.

was unavoidable and he should prepare for it at once.

He came under my care on the 16th day of May, 1902. He presented a wretched condition. Several hypodermic injections of morphine had been given him en route to my place to enable him to withstand the strain of the journey. He was very much emaciated and weak and had considerable fever and no appetite. He presented a large bulging mass on the left side of the neck, head, and face, pushing up the lower lobe of left ear extending in front and behind ear and down on the side of the neck and lower jaw, standing out to one-half of the distance from the neck to the breadth of left shoulder. The summit of the tumor was broken down and ulcerating and measured 4 by 4 1-2 inches in the two diameters from which fungous melanotic tissue arose in a ring around the margins and in the center. There were crevices between these fungous masses through which a probe could be introduced without pain or inconvenience for two inches.

My diagnosis was a melano-sarcoma, and I found it had been so declared twice after microscopic examinations.

I commenced treating him daily with a medium tube placed at a distance of from four to six inches, excited by a twelve-plate static machine of which the plates were thirty-three inches in diameter, and giving ten minutes' exposure. The improvement was all that could be expected; the melanotic mass crumbled and fell off in great chunks; in fact, it disappeared so rapidly that I feared that it would be burned, and began to make five-minute exposures until after July 6, when I found to my consternation that the growth was beginning to return, and instead of the roots continuing to disappear, I saw them beginning to grow rapidly. I then changed to a tube of higher vacuum, and made the exposures at a distance of from three to four inches for periods of fifteen minutes, and I soon brought the growth to a standstill. Retrogression set in the same as before, and I gave him forty-four daily treatments without intermission, when the opening measured but 3-4 by 1 1-4 inches in diameter.

Owing to humidity I have been using for the past month the Kinraide coil and my patient was badly burned. I am now giving him all the treatment I can without burning too severely.

This patient I consider almost well or on a very safe footing, as far as the original cancer is concerned; but as far as metastasis is concerned there is a great deal to fear. To the present time his life has been prolonged, and we have every assurance now that he will live for some time to come and may recover.

The reactions were very severe in his case. The fever ran high and at one time the collapse was dangerous, accompanied with excessive diarrhea and marked sepsis, which was relieved by making many openings for drainage around the tumor and lower part of neck and jaw.

Case II.—Mrs. S., age thirty-six years, white, Jewess married, six children, youngest two years old. I saw her first April 19, 1902, when she seemed well nourished and was very hopeful. She first noticed some trouble with her rectum in September, 1901. In October it was pronounced to be cancer by one of the most prominent surgeons of this city, and was operated upon by removing the rectum and rectovaginal septum for several inches. I found on examination the vagina and old rectal space filled with carcinomatous masses. The operation field was one solid carcinomatous mass, and new masses shaped like small potatoes were in the fornix of the vagina and pelvis. The vagina was opened by a bivalve speculum, and the ray turned on after protecting the surrounding parts with sheet lead. For a while the masses disappeared rapidly and the conquest seemed easy, but the

cancers would come behind the speculum, while in front they would recede. The old rectal space was sore and painful, but the edges and wall were much softer, but were smeared with the feces which were constantly passing from the bowels.

I have great trouble to adjust any protection to keep from burning her, and have given her severe dermatitis at two different times.

To obviate the difficulty of the steel speculum protecting the cancer behind it from the rays, I have substituted a temporary affair of wood which is composed of two thin strips, and by means of which the vaginal wall is held open; the rays, penetrating the wood, reach and affect the cancer. By this means we are able to check the small cancers and hope to finally effect a cure.

This case is a troublesome one, and though I hope to cure the carcinoma, the rectum and field of operation will always remain a great source of annoyance.

The original carcinomas are being checked, and by employment of the wooden speculum, the small ones in the vaginal walls are also under control. The reaction in this case never was very violent. The exposure so relieves the pain that the patient is always ready for her treatment.

Case III.—Mrs. D., age forty-six. Inoperable epithelioma of uterus; was first seen May 18, 1902. She was emaciated, cachectic, and very weak. The cervix was entirely destroyed and the epithelioma was far advanced into the body of the uterus, the parametrium being considerably involved. She was referred to me by a prominent surgeon of Birmingham, he feeling that the only possible hope for her lay in the x-ray treatment. Her life has been prolonged, hemorrhage lessened, and at one time I had strong hopes of curing her; but from unpleasant domestic troubles with which she had to contend, coming out of it in most abject poverty, she was compelled to leave the city and return to her mother in an adjoining state, where death has been or will be unavoidable before long.

If this woman could have been kept and well cared for the result might, and I believe would, have been different, but without treatment she will die.

Case IV.—Mr. D. W., occupation, editor; age, sixty-nine years; diagnosis, epithelioma over right temple, standing out about one-half inch above the skin and covered with darkish yellow secretion and detritus from previous treatment with Byers oil, etc.

The cancer measured one-half an inch by two inches in diameter. X-ray was commenced May 12, 1902. The tube was placed at from eight to ten inches from the surface of the cancer and exposed for about ten minutes. Considerable reaction was present during several weeks of treatment. The cancer, as it were, melted down and disappeared, and it seemed for a time as if the excavation would go to the bone. Finally, however, it began to fill in with healthy granulation, and the patient returned home with rapid cicatrization in progress, August 8, 1902. On August 28 he returned for examination, when the healing was almost complete. He was dismissed from further treatment. I consider him to be cured.

Case V.—Mr. B., age sixty-six years; diagnosis, recurrent epithelioma in the old cicatrices of the left alæ of the nose and another growth about the size of a hazelnut under the left eye over the malar process.

The original epithelioma had been removed three times by paste or caustics and had returned. He was exposed to the x-rays June 1, 1902; a slight primary reaction followed. The growth broke down and in a short time healed over very smoothly. He discontinued treatment July 1, declaring himself well, and he is to all

appearances now cured, there having been no recurrence up to the present time.

Case VI.—S. B., colored, age thirty-four years, stout and healthy, came to me March 1. On the external surface of the right forearm there was a very suspicious ulcer of long duration, which gave her great pain. I sent her to a microscopist, who could not give a positive diagnosis of epithelioma but thought it was one. I gave her five treatments, one or two per week, using a low vacuum tube, exposure five minutes, distance six inches. The reaction was severe after each sèance; and being an ignorant colored woman, she would stand the cancer instead of submitting to the chills and malaise of the reaction. The ulcer, when last seen, was about one-third of its original size. In fact, I have seen no other cancer that has responded so promptly to treatment as this ulcer, nor none which gave so pronounced a chill in the reaction.

There are three other cases which I could add to this report, but it would be simply a repetition. They have not been under treatment long enough to show decided benefit, but all are doing as well as could be wished.

I am most positively convinced that many forms of malignant growth can be cured by patience and a proper exposure to the x-ray.

All x-rays are not capable of doing the same work any more than the winter or Arctic sun will furnish the heat necessary in the tropics. The sun is the same, but the effects of its radiation under varied conditions are quite different, and so with the rays: the individual peculiarity of different patients is an important factor, to say nothing of the different kinds of tumors, and their location and accessibility.

I believe, in the cure of any ordinary malignant growth or cancer, only two things are necessary for their cure, and they are the regulated quality and quantity of the x-ray, employing proper protection of the adjacent tissues.

The superficial cancer requires very different rays from the more remote uterine cancer; in fact, x-rays, from the softest to the hardest tubes, should be used as the individual case requires.

For instance, in treating an epithelioma of the temporal or parietal region of the cranium, it will be found that very powerful x-rays from a hard tube, administered daily, would bring on such mental symptoms and discomfort as to cause you to desist, as it might produce permanent injury to the brain; while in a uterine or other internal cancer it would be the character of the x-ray preferred.

In conclusion I will repeat that I consider the Röntgen ray, when the proper penetrating radiance is employed at the correct distance, and proper frequency and length of exposure, to be almost absolutely a specific for any malignant growth.

DISCUSSION.

Dr. Robinson of Lexington, Ky., thought there was only one way to use the x-ray, i. e., with a high-vacuum tube. A very common error was to use the x-ray too often. He believed treatments given twice a week were generally sufficient. A tube should be used in all cases which will thoroly penetrate the diseased tissue.

Dr. W. B. Snow said that in the case of carcinoma described in the paper the disease returned very rapidly on stopping the x-ray treatment. Since last April he had been treating a case of osteosarcoma of the superior maxilla which had been operated upon by Dr. W. T. Bull. The case was of unusual interest, as showing the persistency and extension of the sarcomatous growth, in spite of vigorous treatment. The original growth having been removed the disease immediately asserted itself elsewhere. The point receiving the most direct treatment would yield, and almost immediately an adjacent por-

tion would become involved. He referred to this because it demonstrated that there was something more than a purely local trouble—in other words, there must be an element back of the local manifestation. He felt that in spite of the treatment metastasis was always apt to appear in some distant part.

Dr. C. E. Skinner said that the point made by Dr. Gibson, that rays of different penetrating power were necessary for tumors in different parts of the body, was of extreme importance. There were many superficial growths in which tubes of different vacuums would have to be used at different times. For instance, a growth would respond well for three or four weeks to a low vacuum, and then there would be no more progress until a high-vacuum tube was used. Another interesting fact brought out in the paper was that mental symptoms might sometimes be produced when using the rays about the head. He had never seen this himself altho he had used the most powerful rays about the head. In connection with treatment of the head it had been asserted that cancer situated in close proximity to bony tissue, and where there was little adipose tissue, as about the vertex of the skull and maxillary prominences, did not respond so well as parts in which there was much adipose tissue, as, for example, in the mammary region. This had not been his own experience, but he would like to hear from others on this point.

Dr. H. Preston Pratt of Chicago said he had been deeply interested in the x-ray, and had been continuously studying it since 1896. He had studied the effects upon different patients, and had given nearly thirty thousand treatments. When beginning this work it had been his intention to systematically study the subject. In the experiments by Professor Röntgen and those by Phillip Lenard the effort was to discover whether or not the cathode stream passed outside of the tube, believing that the x-ray was the old cathode ray. Let us imagine an electrode being placed on one part of the body and another on the opposite side. Allow a current to pass. The result would be ionic changes. The human body is composed of fifteen elements, and these are associated with one another. They are held together by electrical force. When a current was applied to the body the same effect was produced as resulted from the action of one magnet upon another—in other words, metabolism was increased. A simple explanation of the x-ray action was to be found by supposing that it was similar to the action of the ordinary electric current. On the side of the body exposed to the x-ray one obtained an acid, and on the opposite side an alkali. In the x-ray thousands of lines of force are concentrated and the greater the concentration the greater the decomposition and the greater the change in the tissues. By following out this reasoning we could understand what the x-ray had done and was doing. In his own work he was using a low tube on superficial cancer, a tube which would show only the outlines of the bones of the hands. By increasing the force of the machine he was able to penetrate the body. The object was to produce the greatest number of lines of force in the smallest space.

Dr. G. Betton Massey said that this discovery of an acid reaction on the near side and of an alkaline reaction on the opposite side, if confirmed by others, was of great importance, and a more detailed description of it should be given. A certain physicist had said that the action of the x-ray on the human body seemed to him akin to the response given by a sounding board to a given note. Wave action, set up by the x-ray, intensified vital processes, quickened physiological resistance, and hastened the death of low organized tissue. This seemed to be sim-

ilar to the theory briefly described by the last speaker.

Dr. Pratt said that he would go into this subject more fully at a meeting of the Röntgen Society to be held next December. There was absolute proof that the action of the x-ray on the body was due to changes in the ions produced by electrical force.

Dr. Robinson asked how the body could be penetrated by a low tube.

Dr. Pratt replied that it could not be done successfully with the static machine. He made use of low-vacuum tubes and arranged the coil so that he was using at a minimum 1 to 1.5 amperes. By taking out resistance he could, therefore, crowd the current. All the physicians in Chicago who had had much experience with x-ray work were now using low-vacuum tubes because experience had taught them the necessity for this. At first they had used the high tubes, but had not considered that there were streamers from these tubes which produced disappointing results. At first, he had himself used the high-vacuum tube, but he now obtained far better results from the low-vacuum tube; but this tube must be crowded. The static breeze should not be used on the cancer cases. Why? If the finger were infected, for example, would one squeeze it and spread the infection? No. Then, why use the static breeze?

Dr. William Stevens asked how a physician, in general practice, could be taught to make a correct diagnosis of the cases of malignant disease which should be sent for electrical treatment.

Dr. A. C. Geyser said that he wished to challenge the statement made by Dr. Pratt. Two years ago he had brought out the fact that the static breeze should be used only where there was an exposed surface. At that time he had cited cases, and had since exhibited them at a medical society meeting, showing that this was the only and proper method. The cases had absolutely refused to heal until the spray had been used. Dr. Snow and others in the school would bear out this statement.

Dr. Gibson closed the discussion. He said that he did not believe any two cases could be treated exactly alike by the x-ray. He believed he had saved his cases from metastasis by the treatment. He believed in skin cancers the soft ray would frequently do the most good. When the ray would penetrate the body well he called such a ray at least one of medium hardness. As soon as a physician met with an ulcer or other suspicious condition which would not readily heal he should have a microscopical examination made, and if the diagnosis pointed to malignancy the x-ray treatment should be resorted to.

The Chicago Electro-Medical Society.

The annual and the 16th regular meeting of the Chicago Electro-Medical Society was held in room 912 Masonic Temple, Wednesday evening, November 26th, 1902. The first vice-president, Dr. Pettyjohn, in the chair. The minutes of the last meeting were read and approved.

John P. Webster, M. D., O. McMichael, M. D., and others, were elected to membership.

The secretary reported that the membership one year ago was: Regular members, 11; associates, 6. In September last, when an attempt was made to disband the society, the membership was: Regulars, 27; associates, 11. The membership now is: Regulars, 51; associates, 16.

The election of officers and committees resulted as follows:

President, Elmore S. Pettyjohn, M. D.
1st vice-pres., W. K. Harrison, M. D.
2nd vice-pres., John E. Gilman, M. D.
3rd vice-pres., E. G. Trowbridge, M. D.
Secretary, T. Proctor Hall, M. D.
Treasurer, Wm. E. Holland, M. D.
Executive Committee: H. Preston

Pratt. M. D., R. H. Bartlett, M. D., John P. Webster, M. D.

Membership Committee: J. L. Hammond, M. D., P. S. Replogle, M. D., Hamilton B. Forline, M. D.

Publication Committee: H. Preston Pratt, M. D., A. W. Smith, M. D., J. E. Harper, M. D.

Judiciary Committee: L. D. Rogers, M. D., Frank Duncan, M. D., W. A. Pratt, M. D.

Dr. H. P. Pratt gave notice of an amendment to the constitution providing for assistants to the secretary and treasurer, and for an addition to the standing committees.

On motion the following resolution was adopted:

WHERAS, The report of the Committee on Scientific Research, which was unanimously adopted by this society March 25, 1902, showed that Dr. H. Preston Pratt, a member of this society, was the first to make use of the x-rays for therapeutic purposes; and

WHEREAS, Claims of priority in this work have been made and are still being made by various other persons; therefore the Committee on Scientific Research is requested to extend and complete its historical investigations regarding the therapeutic use of the x-ray during the years 1896 and 1897.

The next meeting will be held Monday evening, December 29, at 8 o'clock, in room 912 Masonic Temple. Papers will be presented by W. K. Harrison, M. D., and Byron Robinson, M. D.

The president elect, Dr. Pettyjohn, read a paper on Electro-Therapeutical Practice, which follows.

T. P. HALL, M. D.
Secretary.

Notes on Electro-Therapeutics.

ELMORE S. PETTYJOHN, M. D.
Professor Principles and Practice of Medicine, Harvey Medical College; Dean and Professor Practice and Nervous Diseases Chicago College of X-Ray and Electro-Therapeutics; Member American Roentgen-Ray Society, etc., etc.

The practice of electro-therapeutics is too general among the best physicians to need any encomium. Electro-therapy is one of the approved remedial agencies used with great success and scientifically in practice and in sanitariums thruout Europe and America. We need only to be reminded of its efficiency and I give but briefly, results of the treatment by electro-therapy in a few of the many ailments to which this treatment is applicable.

These I have noted in my own practice for the past 15 years.

ELECTRO-DIAGNOSIS.

In 1839 Marshall Hall called attention of the profession to the value of electricity in the differential diagnosis of paralysis. The necessity of familiarity with normal electrical reactions of the different tissues and organs of the body is obvious. As there is no definite standard of electro-sensibility we must depend on principles and the individual patient, rather than rules and generalizations. Increased sensitiveness of any tissue (or its diminution) indicates abnormal condition, to be determined by other means combined with the electrical phenomena. Our first study is that of Electro-Anatomy.

It is only by practice and continued observation that we are able to determine how much electricity enters the muscular tissue and traverses the nerve substance. We must also distinguish between simple cutaneous hyperesthesia and the irritability of the underlying muscle. The conductivity, resistance and absorptive power of the skin and muscles below, depend on the density, the amount of liquid contained therein, and the temperature of the part treated: the temperature, moisture, size and composition of the electrode used;

the strength, continuance and frequency of the current used, whatever form is employed.

To influence the deep structures, especially in the presence of congestion or inflammation, the current should be diluted by using a large surface applicator of the proper substance (spongiopiline in continuous current), and a mild current more frequently repeated, rather than a strong current, under most conditions.

We are to be guided by the principle of hastening metabolism (that constant succession of elimination and repair occuring in the cells of the tissues), the susceptibility of the individual, and the personal equation, born of experience.

We should all be familiar with the principles of muscular action and reaction, and the various contractions in a normal condition under the influence of the electrical current designated by C.C.C., A.C.C., A.O.C., C.O.C., else how may we determine the reaction of degeneration or the absence of action by degeneration?

GOITRE.

In treatment of simple enlargement, (recent or long continued) of the thyroid gland I have been successful in the use of galvanism, using the anode with small electrode over the gland, with a large kathode well moistened on which the patient places both hands, using 8 to 15 ma., once or twice a week. In cases of longer duration (apparently recurrent) I use ung. hydrarg. biniodid, by placing abundance under an antiseptic electrode covered with protective conductor, using anode over the gland and kathode as above, the same amperage, making the application every six days. Care should be taken not to use a strong current, nor for over two minutes on the same surface. The epithelium will be darkened and reddened and probably exfoliate, but the constitutional effect and diminution of the glandular enlargement will be positive. In these cases as in others, aside from the electrolytic action in the electrode itself, which, of course, should be nonoxidizable (the which I do not attempt to formulate), there is undoubted transfer of a portion of the medicament, the mercuric ions which move toward the kathode, into the tissues of the gland. The amount of mercury carried into the gland is directly proportional to the strength of the current, which, again, is subject to Ohm's law,

$$\text{Current} = \frac{\text{E. M. F.}}{\text{Resistance.}}$$

Superficial neuralgia is relieved with 4 per cent solution cocaine placed on the surface of the positive electrode, usually covered with absorbent cotton, being careful of the amount used. The obvious difficulty in administering narcotics and sedatives is in measuring accurately the quantity administered. This may be done with proper apparatus.

MERCURY.

I have induced successful absorption of ung. hydrarg. under a large electrode placed over ung. after rubbing, in a larger quantity than would be absorbed without the current. This is a decidedly preferable method to the use of mercury in the bath, particularly on account of the debilitating effect of the warm bath when used even every other day.

In the treatment of various and varied muscular atrophies and paralyses which is a large and fruitful field of electrical application, all electrical treatment (and so with any other) to be successful and rational must consider the etiology, diagnosis, pathology and classification primarily. We are then only ready to select the appropriate form of application of electricity or the x-ray in accordance with the pathological condition in which we find the organ, or diseased tissue.

Treatment of the infantile paralyses has been naturally most successful. Atrophy not always being strictly a paralysis is most amenable to treatment. Spinal

curvatures are often the result of unequal atrophy of the muscles of the trunk; the deltoids and the trapezii.

I permit less than a week to elapse after the acute condition begins in the cord (poliomyelitis anterior) to avoid further irritation of inflamed areas. Electrical treatment will then arouse the ganglionic cells. The kathode is placed in water under the feet (at body temperature) the anode moved gently along the spine and alternately traversing the affected limb. Ten to twelve ma. are used at each treatment for from 6 to 10 minutes daily or on alternate days. An interrupted galvanic current is used to stimulate muscular contraction and gentle massage is then given daily to hasten metabolism in the affected parts.

EPILEPSY.

In epilepsy I use electricity because I believe it has a special influence on the nerve centers of the brain and on the cerebral circulation, and also because of its constitutional effects in hastening elimination and repair which are the essential processes of good health in the brain as elsewhere. There is apparently a similar sedative effect in the administration of bromides and the use of central galvanism and general faradization. If, as we believe, idiopathic epilepsy is caused by excitability of the cerebro-spinal centers, central galvanization, which often puts a patient asleep in a few minutes, should have a sedative effect on an epileptic—and it does. My preference is central galvanization alternated with carefully applied cephalic galvanization, always using weak currents, not over 3 ma., the duration one minute, repeated alternate days. A large anode is placed on the forehead with kathode to the base of the cerebrum, the hair being thoroly wetted. Two or three treatments may be given 10 minutes apart, at the one sitting. Time forbids the report of cases to substantiate the results.

In conjunction with this treatment every tonic and hygienic measure is used. Suffice it to say that I have had cures in cases where only the bromides had been used, the patient being in the hands of eminent specialists six years, with no improvement. I have such cases now under my care that are improving.

92 STATE ST.

City of Chicago.
John E. Owens, City Attorney.

CHICAGO, Dec. 16, 1902.

Dr. H. Preston Pratt,
Masonic Temple, City.

DEAR DOCTOR:

I have the honor to tender you the appointment of X-ray Expert and Electrical Diagnostician of the Legal Department of the City of Chicago. This office has become necessary on account of numerous attempts at fraud through the evidence of x-ray and electrical so-called experts in claims against the city for personal injuries.

As a pioneer in x-ray therapy and as an electro-therapeutist of well known ability and long experience, I know the Law Department of the city will be immeasurably the gainer by your acceptance, which, I hope, you will transmit to me without delay. Yours truly.

JOHN E. OWENS,
City Attorney.

The following prominent members of the American Electro-Therapeutic Association were present at the Chicago meeting of the American Roentgen Ray Society:

Clarence E. Skinner, M. D., LL. D., the popular secretary, New Haven, Conn.; J. D. Gibson, M. D., Birmingham, Ala.; Harvey H. Roberts, M. D., Lexington, Ky.: Willis P. Spring, M. D., Minneapolis; Professor W. E. Goldsborough, Chief of the Department of Electricity, World's Fair, St. Louis.

American Roentgen Ray Society.

Third Annual Meeting held in Chicago, December 10-11 1902, under the presidency of Dr. G. P. Girdwood, of Montreal, Canada.

The first paper on the program was read by Dr. T. Proctor Hall, Chicago,

X-RAY PHYSICS.

The author considered the physics of the x-ray, discussing the subject from the purely scientific standpoint. In conclusion he exhibited a new fluoroscope designed by Dr. H. Preston Pratt, of Chicago, which in his estimation is a very superior instrument. He believes that the x-rays are electrical waves of some sort, and are the result of some electrical disturbance.

This paper was discussed by Drs. Clarence E. Skinner and L. E. Custer, and Major W. C. Borden.

EQUAL POTENTIAL SURFACES IN X-RAY FIELD.

Dr. John C. Pitkin, of Buffalo, N. Y., contributed this paper. He considered the principles and mechanics of the static machine and exhibited an apparatus of his invention, which illustrated that many small air gaps in a simple series are superior in action to one long interval. This apparatus consists of a solid glass rod about twelve inches long and one-half inch in diameter, on which are slipped a number of plain brass band rings, which are freely movable so as to form intervening air gaps. He finds that this apparatus greatly intensifies the x-ray. In order to avoid distortion of the x-ray image, the fluoroscopic screen and the photographic surface should be made to conform to the shape of these equi-potential surfaces.

Discussed by Drs. T. P. Hall, H. E. Waite and J. Rudis-Jicinsky.

PRESIDENTIAL ADDRESS.

Dr. Girdwood reviewed the origin of electricity and the various terms used in this science. The gradual development from the time of the early Greeks up to the present day and the discovery of the Roentgen ray, were fully considered. The skiagraph, the fluoroscope and all the modern electrical appliances used either for purposes of diagnosis or therapeusis were described in detail. In this connection the author called the attention of the society to the fact that it has always been customary in electrical circles when any new discovery is made to honor the discoverer by giving his name to the finding. For this reason we should always refer to the x-ray as the Roentgen ray. The nature of the rays was also discussed and the author exhibited a number of skiagraphs made by him when the work in this line was still in its infancy.

SYSTEMATIC RECORDS; THE ROUTINE USE OF THE X-RAYS.

Mr. W. J. Wilbert, of Philadelphia, Pa., described the method of keeping records of x-ray work which is in vogue in the hospital of which he is the radiographer. The former system of keeping the records on cards has been abandoned for the book record, which is more convenient and also more practical. The records cannot be lost and by means of letters, numerals, and various signs, the records can be kept very fully and be intelligible only to the hospital authorities. The book is fully indexed, with profuse cross references.

He also called attention to the advantages which accrue from the routine use of the x-ray in all cases that present themselves for treatment, especially in the hospital. Cases of fracture, especially when of the inter-articular variety, are often mistaken for a simple case of sprain or luxation. Even a beginning tubercu-

lar hip joint disease may be wrongly diagnosed. But when it is made a rule to use the x-ray in every case these errors are not liable to occur. He exhibited a number of skiagraphs and gave histories of the cases illustrating this point. The x-ray should not be used only in law or for show cases.

Discussed by Drs. Scott, Girdwood, and Major Wm. C. Borden, U. S. A., of the General Hospital at Washington, who related several cases of enlisted men who had received an injury of the knee and in which a diagnosis of fracture was not made until some time afterward when he used the x-ray. He believes that every case of injury to a joint should be rayed, no matter whether it be one of fracture, supposed sprain, or dislocation, as these are oftentimes mistaken one for the other, and only by using the x-ray will it be possible to know what treatment it is proper to give.

SKIAGRAPHY AS AN ART.

Dr. J. Rudis-Jicinsky, of Cedar Rapids, Ia., contributed this paper. He advised among other things that no greater part of the body be illuminated than is absolutely necessary, and the rays should be concentrated at the point to be exposed. Nor should the parts be over-illuminated. Both over and under-exposure must be avoided. In the preparation of a good skiagram great skill and judgment are necessary, for the expert is often able to find things which are entirely unintelligible or invisible to the novice. The correct reading of the shadows of a skiagram is by no means an easy task. In closing he described his method for making skiagraphs and exhibited numerous negatives showing the results of his work.

RESULTS AND TECHNIQUE IN TREATING EPITHELIOMA WITH THE X-RAYS.

The author, Dr. Emil H. Grubbe, of Chicago, decried the indiscriminate use of the high and low tubes in the treatment of epithelioma with the x-ray. We should always use a tube with a vacuum just high enough to penetrate the tissues to be exposed. Inflammation of deep and surrounding tissues is to be avoided. Either the static machine or the induction coil may be used in this work. When the static machine is used it is advisable to use at least two series spark gaps between the machine and the tube. If the coil is used the connection may be made to the tube without the use of the spark gap in series. The principal thing is to maintain a constant vacuum in the tube. The controlling factors of this method are the quality of the tube, the distance of the tube from the parts to be treated, the time of exposure, the frequency of the exposure, and the exciting apparatus. The time of exposure depends on the x-ray intensity.

The treatments are given daily with exposures of ten minutes. The tube is placed from four to six inches from the affected part, and the ray is then applied until a reaction ensues in the shape of redness, heat and itching, when the treatments are discontinued for from two to seven days. When the treatment is resumed the patient is again exposed in the same manner to the same rays. The parts not to be treated are protected by a thin mask of sheet lead. The occurrence of dermatitis does not retard the cure; in fact, a dermatitis is usually an indication that the treatment is beginning to be effective. Proper general or systematic treatment should be used in conjunction with the x-ray.

In about half the cases which came under the author's observation the disease was located upon the surface and was readily brot under the influence of the ray. A large number of cases are referred to and the results tabulated. In the majority of the cases his efforts were successful and of such a nature as could not have been obtained by any other

method of treatment. An absolute cure is not claimed, but only a symptomatic cure. In all cases of uncomplicated superficial epithelioma, in which the diagnosis was made early, the results have been such as to warrant the use of the word "cure" in its fullest sense. In inoperable cases the x-ray is as nearly a specific as any other therapeutic agent in use today. The results vary with the location of the disease.

Dr. Clarence E. Skinner, of New Haven, Conn., agrees with the author except as to the necessity of producing a dermatitis, altho in the majority of the cases the cure is hastened by the production of some dermatitis, but not in all.

Dr. Gibson, of Birmingham, Ala., said that in the East they avoid burning, whereas in the West they do not seem to care much whether they burn or not. Personally he favors neither burning nor the use of the intensified rays, as it is liable to produce too much detritus, which will retard the progress of the case, and perhaps even destroy life. The treatment ought, under no condition, to be pushed beyond a burn of the first degree.

Dr. J. C. Pitkin, of Buffalo, said that if we expose cases of cancer that have resisted the x-ray to the ultra-violet ray a speedy cure will result. Not in all cases but in a large proportion.

Dr. G. C. Burdick, of Chicago, called attention to the difference between a dermatitis and necrosis or sloughing. Some persons appear to possess an idiosyncrasy to the x-ray with the result that even after a very few exposures a decided dermatitis results. No application of any kind should be made to an x-ray burn. Expose it to the air and when vesication occurs apply benzoinated lard with a gauze protection. This promotes healing considerably. He does not believe it necessary to burn and tries to avoid it as much as possible.

Dr. E. J. Brown, of Decatur, Ill., believes in producing a dermatitis and finds that it is much easier to produce a burn on the body than on the face, and the former is also much more difficult to cure. He makes it a practice to give the treatment in relays, giving from six to eight treatments, or until he gets a dermatitis. He then waits for the reaction, after which the treatment is resumed. Surgery is much more destructive than the x-ray, both as to function and cosmetic effect. The ray destroys little tissue and does not interfere with function.

THE ROENTGEN RAY AS A THERAPEUTIC FORCE, FROM A CLINICAL STANDPOINT, WITH ILLUSTRATIVE CASES.

Dr. John B. Murphy, of Chicago, the author of this paper, said that in the fracture element in surgery the x-ray is of enormous benefit, altho it is by no means infallible. He exhibited two skiagrams and related several cases in support of this statement. In tuberculosis of the joints the x-ray enables us to learn just what class of cases are going to be benefited by injection and which are not. That is, whether the lesion is limited to the synovial membranes or to the bones, or whether it involves both. If the x-ray shows that the lesion is primarily synovial we inject and the patient recovers. It is also valuable for both its diagnostic and therapeutic effect in tuberculosis of the bones and joints. One case he cited, a tuberculosis of the knee joint, was cured in twenty-one days. He has also found it useful in tuberculosis of the spine. He cited three cases in which a granuloma had formed and a paraplegia resulted. One was cured after twenty-five applications of the ray, another after twenty-one, and another, still under treatment, is walking about free from pain after twenty-three applications.

So far as renal calculi are concerned, the x-ray is apt to be exceedingly misleading. An English hospital reports that

in about eight per cent of cases in which the ray showed a stone the operator was unable to find one; in some cases because the stone was not there, and in others because it could not be found. Accumulations in the alimentary canal sometimes give a shadow which may be mistaken for a stone. Care should be taken to get a good radiograph and an expert to interpret it before making any positive statements as to the absence or presence of a stone.

In regard to the therapeutic use of the ray in malignant disease, the author exhibited a slide taken from a case of carcinoma of the breast which was considered inoperable and was referred for treatment with the x-ray. The size of the tumor diminished rapidly, but after twenty-six applications the patient died from an intercurrent gastritis. The tumor was enormously reduced in size and the microscopic examination showed that there was an increase in the connective tissue elements and a decrease in the cellular elements, with a considerable vacuolation of their protoplasm. The carcinomatous glands were not in the least affected by the ray, including a gland at the periphery of the growth and which had received the full force of the ray. The therapeutic effect of the ray on intestinal and tubercular fistulas elsewhere should not be overlooked. The sinuses are closed up rapidly.

Dr. A. M. Phelps, of Battle Creek, Mich., related a case of carcinoma of the breast with extensive metastasis in all parts of the body. The case was considered inoperable and was treated by the x-rays as a last resort. The result was an excellent one so far as a disappearance of all the tumor masses went. They were considerably decreased in size, showing the decided effects that can be produced upon the deep seated structures by the x-ray.

Dr. Gordon G. Burdick, of Chicago, cited a number of cases of sarcoma and osteo-sarcoma which had yielded to the x-ray treatment. Altho the growths did not disappear entirely yet they shrunk considerably in size. All pain disappeared and the general condition of the patient is greatly improved. The growth remains stationary, which is very unusual for a sarcoma of any kind.

Dr. J. P. Marsh, of Troy, N. Y., related a case of melano sarcoma involving the left shoulder and side of the chest, with numerous metastases in the subcutaneous tissues, in which blood counts had been of some value from the side of prognosis. When the treatment was begun the leucocytes numbered 18,000. They gradually decreased in number after each treatment and the patient became correspondingly worse. He has observed that if the leucocyte count goes up the case will yield quickly, but if the count goes down the outcome is usually not a favorable one. He believes that x-ray workers should pay more attention to the blood count.

Dr. Clarence E. Skinner, of New Haven, Conn., is of the opinion that different cases of sarcoma respond differently to the x-ray. He mentioned one case of very extensive sarcoma of the neck which had existed for three years and yielded to the ray after seven weeks' treatment; whereas a scond case of sarcoma of the parotid gland, a recurrence after operation, was not affected at all. He suggests that it might be an idiosyncrasy to the ray.

Dr. Gibson, of Birmingham, Ala., said that some of the best results accruing from the treatment with the ray were in cases of melano sarcoma. A case in point was cited, in which improvement took place rapidly until the patient voluntarily left the sanitarium while still under treatment. We must learn what kind of a ray to use, the frequency and duration of the exposure, in order to obtain good results.

Dr. J. Rawson Pennington, of Chicago,

cited a case of cancer of the rectum in which a colostomy had been performed, with only temporary relief, in which the x-ray was used with good results, and exhibited a special tube which he had designed for such work.

TREATMENT OF THREE CASES OF CANCER, ONE CASE OF TUBERCULOSIS AND SEVEN CASES OF RODENT ULCER AND LUPUS.

Dr. G. P. Girdwood, of Montreal, Canada, reported that in one of the cases of cancer so treated all the symptoms disappeared. The patient's condition was improved considerably, altho a recurrence is probable. The tumor mass was replaced by a soft, pliable tissue, and a healthy growth leaving a cicatrix. The cases of ulcer and lupus were remarkably benefited. The same is true of the case of tuberculosis. The author exhibited photographs and skiagrams illustrating the condition of the patients before and after treatment. In many of them it was well nigh impossible to discover the seat of the original lesion.

THE TECHNIQUE OF TREATMENT OF MALIGNANT GROWTHS.

Dr. J. N. Scott, of Kansas City, Mo., the author, said that the apparatus used should be powerful enough to excite the largest tube to its fullest capacity with a full control of the current. He never applies the ray strong enough to produce necrosis, which is apt to irritate and stimulate that part of the growth not yet destroyed. His results are much better when the case is treated every day. The first exposure is not longer than four minutes. This is gradually increased to eight until a reaction appears, when the time of exposure is again reduced. The growth is exposed from as many directions as possible. The general condition of the patient must be watched and all his functions kept active. The x-ray will cure a certain per cent of cases and improve nearly all. It is far superior to the knife in that the original tumor as well as the metastasis can be treated at the same time, thus preventing any further spread. It is also applicable where the knife could not be used. The author described an apparatus which he invented to prevent the possibility of producing a burn on other parts of the body or on the person of the operator. It consists of a large box which is suspended from the ceiling. It contains the tube the rays from which pass out thru an opening the size of which can be regulated by a series of shutters.

He prefers to have bad cases operated upon and immediately referred for treatment by the x-ray.

Dr. A. M. Phelps, of Battle Creek, Mich., suggested that, instead of operating and then using the ray, the growth be excised with a cautery knife, after the method used by the late Dr. Byrne, of Brooklyn. It lessens the possibility of reinfection of the healthy tissues.

Dr. C. N. Bibbins, of Watertown, N. Y., reported a case of carcinoma of the throat, involving the fauces and extending up into the nares. As much of the growth as possible was removed by a surgeon with the curet and cautery knife, after which the x-ray was used twice a week. At the end of four weeks it had healed entirely. The patient then disappeared and returned later with a recurrence. After thirty-eight treatments the growth again disappeared and the patient has since been well without any recurrence of the trouble.

Dr. Gordon G. Burdick, of Chicago, advises against the protection of the normal tissues when raying a carcinoma, except when the tumor is located on the face, when for cosmetic reasons alone a lead mask should be applied. The diseased tissue always breaks down before the healthy tissue.

Dr. Lester E. Custer, of Dayton, O., exhibited a screen which he devised to

prevent burning of the healthy tissues. It consists of a large metal stand with an arm in which is held a series of metal plates like the top of a water bath. The size of the opening can thus be regulated and the screen is freely movable in every direction.

RADIO-THERAPY IN PULMONARY TUBERCULOSIS.

Dr. Gordon G. Burdick, of Chicago, contributed this paper. He conducted a series of experiments with guinea pigs which were inoculated with virulent tubercle bacilli. Some of them were exposed to the action of the x-ray, with the result that they invariably outlived the pigs not exposed. Altho it was possible to inhibit or check a culture he did not succeed in killing the bacillus. In the cases of human tuberculosis which he has treated, a slight but certain improvement takes place and eventually a good recovery. That is, there was a cessation of the temperature, cough, night sweats and diarrhea, and a return of weight and strength. There was no recurrence of the disease, altho in a number of the cases tubercular bacilli were found in the sputum first raised in the early morning.

Hemorrhages were always promptly controlled. Cases of fibroid tuberculosis yield slowly. The consolidated areas in the lung clear up to a very great extent. Abdominal tuberculosis requires more prolonged treatment. In chronic tuberculosis there is a disappearance of the symptoms, but improvement in weight is slow. In mixed infections improvement is also slow and there is a great tendency to the development of toxemia. Joint tuberculosis, involving only the bones, offers the best results. Permanent relief cannot be obtained until complete ankylosis has occurred and nothing should be done with the x-ray until ankylosis is complete: The results obtained by the author in 43 cases of tuberculosis located in all parts of the body were very good. Only one of the cases died, a case of advanced general tuberculosis. It is not an exclusive method of treating tuberculosis of the lungs, but only a useful adjunct in the treatment. Unquestionably good results have been obtained with this treatment, but not an absolute cure.

Dr. J. Rudis-Jicinsky, of Cedar Rapids, Iowa, has treated twenty cases of pulmonary tuberculosis with the x-ray. Sixteen of them were considerably improved and four were completely cured, and have remained so for six years. In tuberculosis of joints his results have also been good, but he cautioned against the idiosyncrasy of the patient. In glandular tuberculosis the results have been less promising. Recurrence nearly always takes place.

Dr. Russell H. Boggs, of Pittsburg, Pa., reported six cases treated, all of them showing decided improvement, except one which died from an intercurrent affection. One of the cases has remained in good health for over a year and is absolutely cured.

Dr. Gibson, of Birmingham, Ala., said that he has seen many cases of tuberculosis which improved considerably under treatment, altho they were not cured, so that they could continue in comfort with their occupation. He believes that the x-ray is a most important and efficient means in the treatment of tuberculosis. In cases of mixed infection packing can be used to good advantage. It reduces the temperature, diminishes the cough and night sweats, and the patient gains rapidly in weight and strength.

Dr. Kraus, of Memphis, Tenn., reported two cases cured by exposure to the rays.

Dr. Phillips, of Cincinnati, O., in treating tuberculosis of the joints uses a static cataphoresis instrument, using such remedies as formaldehyd and creosote. He believes he gets better results than when the ray alone is used. He has just begun this method in tuberculosis of the lungs and thus far the results have been good.

X-RAY TREATMENT IN INTRA-ABDOMINAL AND OTHER DEEPLY LOCATED MALIGNANT GROWTHS.

Dr. Clarence E. Skinner, of New Haven, Conn., read a paper with this title. He states that the effect of the x-light on cancer was entirely due to its specific influence on the tissues. He reported 38 cases in which this treatment had been used with a varying result. There was a complete disappearance of the disease in three cases; a continuous reduction in size of the tumor in 15; temporary reduction with subsequent increase, ultimately resulting fatally, in one; complete apparent arrest in four; no effect demonstrable in the size of the tumor in 15; complete permanent relief of pain in 16; complete temporary relief in three; partial in eight; no relief in four; and in seven there was no pain. The general condition of the patient was improved in 14; temporarily in 8; no influence apparent in 9; in 7 the general condition was not noticeably impaired when patient applied for treatment. There was gain in weight in 6; no apparent influence in 32. Hemorrhage was lessened in 9; not influenced in 2; and no hemorrhage observed in 27. Toxemia of varying degree in 15 cases. In five cases there was no evidence of any benefit, and three of these cases discontinued treatment after two or three treatments. So that out of a total of 38 cases we have three apparent cures; 17 continuously benefited, and they are still improving with good prospects of an ultimate cure; 13 temporarily benefited; in two no benefit, and in three the treatment was discontinued by the patient regardless of any benefit. Every one of these 38 cases was an imoperable one because of advanced disease and offered a perfectly hopeless prognosis by any ther method of treatment.

Conclusions: 1. The pain of deeply seated cancers is removable by the x-light from slight amelioration to entire disappearance.

2. In many cases x-light is capable of exercising an influence on deeply seated cancers of sufficient intensity to remarkably retard the disease and thus prolong life.

3. In a certain proportion of cases it possesses the power to entirely overcome deeply seated malignant processes.

4. A small number of deeply seated processes exhibit absolutely no indication of being susceptible to the x-ray.

5. Phenomena indicative of toxemia not infrequently accompany the treatment of malignant diseases by the x-ray. This is due to the elaboration of toxic substances owing to the retrograde metamorphosis of the tissues which are insusceptible of regeneration.

The author made three applications weekly, three to five minutes at a time, taking into consideration the condition of the patient, the apparatus, and the result of the treatment.

Dr. J. P. Marsh, of Troy, N. Y., had a patient referred to him for hysterectomy because of a carcinoma of the cervix. He used the x-ray instead, applying it per vaginam and supra-pubic, alternately. After about thirty treatments there was an entire symptomatic cure.

Dr. J. Rawson Pennington, of Chicago, said that he found that among x-ray workers the best results are obtained when the lesion is a superficial one, because the rays can be brought to bear directly on all parts of the growth. This makes the treatment of deeply seated growths rather difficult and hence the results are not as good. To obviate this difficulty he has designed a special apparatus consisting of two brass hemispheres which are clasped together over the tube. The hemisphere opposite the target of the tube has a large opening in one end thru which the rays can pass. Around this opening is a flange to which any size and variety of speculum can be attached. To the second hemisphere is attached a handle which gives the

operator complete control of the tube and the rays can be directed anywhere on all parts of the growth. He prefers a high tube for deep-seated lesions.

Dr. J. N. Scott, of Kansas City, Mo., prefers to use the rays in these cases after the patient has been operated upon by the surgeon, and he begins the x-ray treatment as soon after the operation as possible. It hastens the healing process considerably if the work is done carefully. Hemorrhage is also quickly stopped.

DIAGNOSIS OF CALCULI BY THE X-RAYS.

Dr. Russell H. Boggs, of Pittsburg, Pa., considered this subject. He said that the x-ray is the only means by which calculi can be diagnosed absolutely. The symptoms are often very obscure and point to many conditions other than calculi. Even minute particles of uric acid can be radiographed. Many gallstones have not been radiographed because of the location of the gallbladder, the changes in position to which it is constantly subjected by respiration, and the position of the gallstone. When radiographing for gallstones we should use a large amperage for a short time. The apparatus must be a suitable one and the preparation of the patient is as essential as for a surgical operation. The time of exposure will vary with the size and condition of the patient, from two to eight minutes. A number of cases were reported and the skiagrams exhibited showing the results obtained by the author in this work.

Dr. J. Rudis-Jicinsky, of Cedar Rapids, Iowa, advised that when making a radiograph for renal calculi a plate large enough to cover both the kidneys and the ureter should be used, because sometimes the stone may be located in the ureter and would otherwise not appear in the skiagram. The plates should always be examined first to make sure that they are free from spots, air bubbles, or any other defects which might be mistaken in the skiagram for a stone. It is also advisable to make two exposures or to use two plates, for if a shadow appears in both plates in the same spot it is not a defect but a real shadow. Stones composed of cholestrin do not always throw a shadow and very often are very indefinite. The phosphatic stones usually throw a very distinct shadow.

Mr. W. C. Fuchs, of Chicago, believes that for a successful radiograph three things are necessary: a good plate, a good apparatus and a good tube. He emphasized the point made by Dr. Rudis-Jicinsky and described his methods of work, exhibiting a number of radiographs illustrating his remarks.

THE TECHNIQUE OF X-RAY THERAPY.

Dr. H. Preston Pratt, of Chicago, contributed this paper in which he considered, first, the nature of the x-ray and second, its application. He said to always use a soft tube and to crowd it, and use a tube high enough to penetrate the tissues to be treated. Never use a high tube near the body, because the discharge from the terminals produces muscular contractions which tend to carry any possible infection along the lymphatics. Never use a strong static breeze or sparks in skin cancers, as it is liable to make the general condition worse, altho there may be an improvement in the local condition. Never expose a large surface at one time, because of the large amount of effete matter thrown into the system, which may produce a fatal toxemia. Keep the eleminative organs active. Never expose the patient directly to the ray, but interpose a celluloid screen 1/32 to 1/16 inch in thickness. Before exposing render the part antiseptic. Never be afraid of an x-ray burn. Malignant diseases do better with an x-ray burn than without it.

Dr. R. V. Wagner, of Chicago, said that the x-ray emanates from the motion of the rarified air particles in the tube, and when that produces movement of the molecular structures in the tissues we produce a certain amount of waste. If more waste

is produced than can be absorbed by the tissues it accumulates and acts as an irritant, setting up an inflammation which is called an x-ray burn. The movement imparted to the tissues by this inductive action is the real benefit derived from the use of the x-ray.

The paper was very fully discussed from the physicists standpoint by Mr. C. H. Treadwell, Chicago; Dr. J. N. Scott, Kansas City, Mo.; Dr. T. P. Hall, Chicago; Dr. E. H. Grubbe, Chicago, and Dr. G. P. Girdwood, Montreal, Can.

Dr. Wm. Jordan Taylor, of Cincinnati, O., contributed a paper in which he related the sudden and unaccountable explosion or collapse of a tube, which very nearly resulted in serious consequences. The tube had not been in use for about fifteen hours and no current was passing thru it at the time. It was smashed into thousands of pieces which were thrown with great violence all over his laboratory.

Others of the gentlemen present related similar experiences, and one suggested that the tube be covered with silk or some other material which is pervious to the x-ray.

Dr. J. Rudis-Jicinsky suggested that the tube be placed in a box like that devised and constructed by Dr. Scott, of Kansas City, and that the opening in the box be closed by a piece of silk.

The following officers were elected for the ensuing year:

President, Prof. Arthur W. Goodspeed, Philadelphia.

Vice-presidents, Dr. John B. Murphy, Chicago; Dr. Wm. Jordan Taylor, Cincinnati, O.

Secretary, Dr. J. B. Bullitt, Louisville, Ky.

Treasurer, Dr. Weston A. Price, Cleveland, O.

Member of Executive Committe, Dr. Ralph R. Campbell, Chicago.

EDITORIAL.

World's Fair Congresses.

The President of the Exposition Company has announced the organization of World's Congresses to be held in St. Louis during 1904. Howard J. Rogers, Chief of the Department of Education, is to be the Director of Congresses. The Advisory Board to work in conjunction with him is as follows: Chairman, Nicholas Murry Butler, President of Columbia University, New York City; William R. Harper, President of the University of Chicago; R. H. Jesse, President of the University of Missouri; Henry S. Pritchett, President of the Massachusetts Institute of Technology, and Herbert Putnam, Librarian of Congress.

The duties of this Advisory Board will be more exacting than usually fall to the lot of advisory bodies. Upon their recommendations will be determined the number and extent of the Congresses, the emphasis to be placed upon special features; the prominent men invited to participate, the character of the programs and the methods for successfully carrying out the enterprise. No effort will be spared to give the series of Congresses at this Exposition unity and connected purpose and make their published proceedings a valuable contribution to the world's literature.

It would be very desirable to have among these congresses one upon Electro-Therapeutics in its broadest sense. Nothing conduces more to the rapid adoption of approved methods than the full discussion of the same in a world's congress. Discussions undertaken by representative men show clearly to the world what is positively known, what is probable, and what is still guess work. We hope that the committee will give this question due consideration.

Meeting of the American Roentgen Ray Society.

The third annual meeting of the American Roentgen Ray Society was held at the Sherman House, Chicago, December 10th and 11th, 1902, the president, Dr. G. P. Girdwood, presiding.

The meeting was remarkable for the large attendance, the uniform high quality of the papers, and the great interest manifested in the papers and the discussions which followed. Not less remarkable was the unanimity of opinion regarding x-ray therapy and its various methods of procedure. The papers were nearly all practical in character, and showed that the workers in this line of electro-therapy are in almost complete agreement regarding the effects of the rays, the advantages that have been already secured from their use, and the directions in which further investigation should be prosecuted.

Dr. Arthur W. Goodspeed, of Philadelphia, was elected president for 1903.

Over 80 members were admitted, and the society has on hand to begin the work of the year about $500. The proceedings of the meeting are to be published in book form so that each member will receive a copy of all the papers read.

The Executive Committee are to be congratulated upon their success in providing a program. Only one paper was (on account of the absence of the writer) read by title.

Correspondence.

DR. H. P. PRATT:

I have been treating two cases of consumption. Have given twelve treatments. How long treatments can I give and what distance should the tube be kept from the patient? I have been giving seventeen inches distance. How far away do you have the tube when treating cancer? Does the patient feel the heat from the tube? A. F. R.

[The first treatment for tuberculosis should be very short, particularly if the patient is in an advanced stage of the disease; say five minutes at a distance of 15 to 20 inches. This distance may be gradually lessened and the length of time increased, as the patient begins to improve. The limit will depend entirely upon the condition of your tube, and the resisting power of the patient. In treating cancer begin in the same way, but if the cancer is small, and particularly if very malignant, begin with seven or eight minutes exposure at ten inches and gradually increase the time. It is seldom necessary to use a tube closer than 10 inches but put it closer if you cannot otherwise obtain sufficient intensity of the x-rays. There is no sensation from the tube, unless it becomes very hot by using a strong current.—Editor.]

EDITOR AMERICAN X-RAY JOURNAL:

How do you fix a static machine for the sinusoidal current? What is it used for? How do you get the "static induced current"? Do you use the jars for the charge and insulation? S. A.

[To obtain the sinusoidal current hang the small jars on the sliding rods; attach flexible conductors to the outer coatings of the small jars. The sinusoidal current is obtained between the ends of these flexible conductors when the sliding rods are such a short distance apart, say one-half inch, that a rapid stream of sparks passes between them. The sinusoidal current stimulates tissue changes, and is used for chronic inflammations, absorption of exudates, non-malignant tumors, local infections, etc. The sinusoidal current is a static induced current. For a charge and for insulation the jars are useless.—Editor.]

EDITOR AMERICAN X-RAY JOURNAL:

I have a patient that has muscular twitchings of the left side of the face. What treatment would you give with static machine? In sunlight days of summer sometimes it draws the side of his mouth out of shape. I seem to be doing him very little good so far. I also have a patient with chronic sciatic rheumatism of ten years' standing.

The leg has atrophied some and he has a pronounced hitch in his gait. How do you treat such with static current? W. E. C.

[A more accurate diagnosis is required before deciding upon treatment for the twitching. For temporary relief try the sinusoidal current from the small leyden jars, with a small spark gap, over the facial nerve.

Locate, if possible, the seat of the trouble. It may be in the nerves, muscles, or joints. The best treatment is the interrupted galvanic placing the kathode along the sciatic nerve. With the static machine use the sinusoidal with large jars; and if good results are not obtained soon, alternate this treatment with the direct current using kathode sparks.—Editor.]

EDITOR AMERICAN X-RAY JOURNAL:

You may be aware that we did not learn in our brief course all that it was possible to know regarding the use of our machines. I received a small German tube, known as No. 7, which acted nicely for a time, but it now shows the ray in but a part of tube—a portion near the anode giving a very different light and it very frequently "flickers" and goes entirely out for a few seconds. Please explain and put me right.

A. R. V.

[Your tube has probably become too high for use. Bake it in an oven for an hour or two, taking care to heat slowly and cool slowly.—Editor.]

Is electricity of any use in the treatment of goitre? T. H.

[Yes. If the goiter is inflammatory use the anode breeze; if degenerative and soft, the kathode and the sinusoidal current; if degenerative and hard, or if malignant the x-ray.—Editor.]

At the January meeting of the Chicago Electro-Medical Society Mr. Edward B. Ellicott, City Electrician of Chicago, will read a paper on "The Relation of Electrolysis to Public Health," which will be discussed by Dr. H. P. Pratt, X-Ray Expert and Electrical Diagnostician of the law department of this city.